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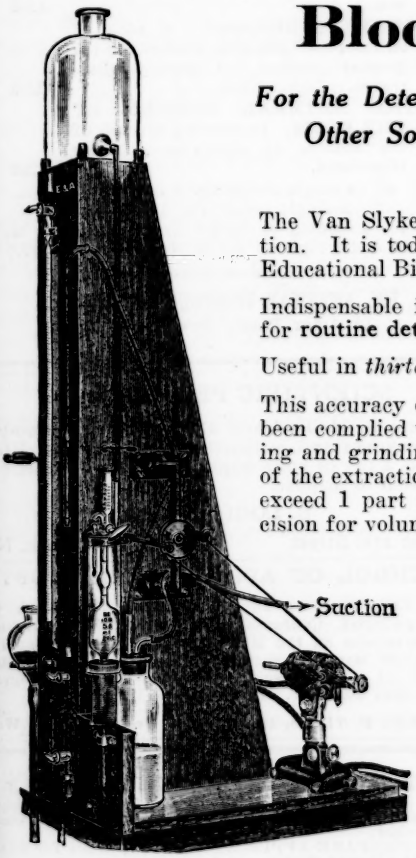

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TWO VIEWS OF THE ORIGIN OF MAN[1]

To speak about phobias in a society that includes so many distinguished psychiatrists may seem like carrying coals to Newcastle. Nevertheless I beg your indulgence for describing a new kind of phobia which is now widely prevalent among the American public. It may be named pithecophobia, or the dread of apes—especially the dread of apes as relatives or ancestors. During the past few years this phobia has become almost pandemic; perhaps we have not yet passed the peak of its incidence, especially in rural communities.

Dr. Osborn and I are now trying out rival prophylactic and therapeutic measures upon our patients. My method, in a word, is to inoculate the patient with the Darwinian theory of the origin of man. Professor Osborn's method is to remove the cause—by abolishing the apes, or rather by disproving their claims to close physical and mental kinship with us. In this way sensitive souls may be able to hear the word "gorilla" without shuddering.

Professor Osborn and myself, sighting the same vastly distant and obscure event, the emergence of man, from somewhat different viewpoints, naturally report somewhat different aspects of it. With unwearied patience and unsurpassed industry Professor Osborn has traced the rise and decline of many long-lived lines of fossil mammals through the long ages of the Eocene, Oligocene, Miocene, Pliocene, Pleistocene and recent epochs, covering, according to the estimates of Barrell, a period not less than sixty millions in years' duration.

Of the generalizations which Professor Osborn has drawn from his paleontological studies the following bear especially on the problem of the evening:

(1) Every great order of mammals is polyphylectic, that is, it includes a large number of genera which may be traced backward along independent lines through amazingly long periods of geologic time. So many are these phyla, as they are called, and so severe the ravages of time upon the fossil record, that one rarely finds the remote common ancestral stocks that gave rise to the many slowly diverging phyla. This has been proved by Professor Osborn and other paleontologists to be the case among the families of horses, tapirs, rhinoceroses, titanotheres, camels, antelopes, deer, pigs, cats, dogs and many other groups of mammals.

[1] Address before the Medical Society of the County of Kings, May 17, 1927.

(2) Each of these phyla is distinguished by a definable assemblage of dental and skeletal characters apparently adapted in each case to some special mode of life. After a phylum begins to specialize in a given direction, that is, toward certain habits, it goes on becoming more and more specialized in the same direction until it becomes overspecialized, or unable to adapt itself to changed environmental conditions, after which it may become extinct. So many examples of this kind could be cited that this has come to be looked upon as the normal course of evolution among mammals.

Professor Osborn has been a leader in expanding our views of the antiquity of man and has already shown you the evidence for the existence of intelligent tool-making men far back in the Pliocene epoch, possibly three or four million years ago. Even at that vastly distant date the ancestors of the horses, asses and zebras were but little different from their modern descendants. So far as known the Pliocene men also were essentially like the men of to-day except in minor points; especially is this true apparently in the essentially human characters of the brain and mind. In view of all this and very much more is it any wonder that Professor Osborn has applied the same principles to the history of man and has come to the following striking conclusions:

(1) The human family, like other families, includes a great number of independently evolving phyla which for untold ages evolved independently of each other in different parts of the world.

(2) As in other mammals, we shall very rarely find the true stem forms at the bottom of the phyletic lines.

(3) The older of these human phyletic lines may well run back as far as many other lines of mammals do, that is, at least to the Lower Oligocene or Eocene. Hence even in those inconceivably remote ages we may expect to find Dawn men—erect-walking, plains-living, large-brained, speaking men, totally dissociated from the family of the apes, especially in their evolutionary trend which was toward life in the open, while that of the apes was toward more and more specialized life in the trees.

(4) Hence the idea of man's ape ancestry is a myth and a bogie, due to our previous ignorance of the real course of human evolution. For millions of years man has been a ground-living, erect-walking being and if at some still earlier period he may have passed through an arboreal stage such a stage could not have been long or have left a very deep imprint upon his skeleton and nervous system.

It must not be supposed that these conclusions of Professor Osborn will be regarded as improbable by many paleontologists. On the contrary, many who have the most intimate knowledge of the history of mammalian phyla are already of much the same opinion. It is a matter of sincere regret to me that I can not follow my honored leader into this new and spacious field of thought. I deem it rather my duty to defend the old and always unpopular view of Darwin, Huxley, Haeckel and others of previous generations. To come to the point at once then, I must attack his whole argument, in so far as it is based upon his studies of mammals other than primates, as a series of analogies, unsupported by direct evidence and outweighed by many definite facts of record.

The slowly evolving phyletic series of hoofed mammals become differentiated from each other at almost imperceptibly low rates, so that it has taken possibly sixty millions of years to produce the structural differences between modern horses and modern tapirs. But it is a mere begging of the question at issue if we assume, as many paleontologists are inclined to do, that it took an equally long period to produce the present differences between man and the chimpanzee. For there is definite evidence that both the human and the anthropoid stocks are far more plastic, less fixed in hereditary grooves, than are the wild species of the horse and tapir families. If we look over a large series of upper molar teeth of wild species of horses, asses and zebras we shall easily see how trivial are the differences in their complex molar patterns. If, on the other hand, we compare an equal number of upper molar teeth of various human races, we shall find a far wider range of variability among them, while in even a small collection of orang or chimpanzee teeth the range of variability will be astonishingly wide. During late Pliocene and early Pleistocene times the variability in lower molar patterns of man was apparently high, since the Piltdown lower molars are almost indistinguishable from those of the anthropoid *Dryopithecus*, while the Heidelberg molars are distinctly human in pattern. So too the variability in molar patterns of the fossil apes of the distant Miocene and Pliocene epochs seems remarkably high in proportion to the small number of specimens known, since hardly any two specimens are closely similar and it is difficult to determine from the fragmentary materials what are the limits of the species. Similar high variability is also characteristic of the lower premolars of recent and fossil anthropoids, some approaching the primitive compressed condition seen in certain jaws of *Dryopithecus*, others being widened and almost approaching the bicuspid form of human lower premolars.

If man and the anthropoids had begun to drift apart as early as did the horse and tapir it is difficult to see why, especially in view of their higher plasticity, they should have remained so much alike

in the structure of their molar teeth that even as late as in Pleistocene times there were still structural transitional stages (Piltdown, Ehringsdorf) between them. Nor is it easy to understand, if man and chimpanzee began to drift apart as long ago as did tapir and horse, namely in the Lower Eocene, why man and chimpanzee should be so much more alike in structure than are tapir and horse and why man and ape should still retain so many physiologic reactions in common in spite of their radical differences in environment, diet and modes of locomotion.

During the twenty-five millions of years of Eocene time the fossil record already known reveals the existence of many genera of tree-shrews, lemuroids (Notharctids) and tarsioids (Anaptomorphids), but none rise anywhere near the human grade of organization; during the sixteen millions of Oligocene time only three genera of fossil primates are known, all in the lower Oligocene of Egypt; of these, one (*Parapithecus*) appears to be a highly progressive protoanthropoid, the other (*Propliopithecus*) has a very primitive molar pattern potentially ancestral to all the anthropoids and man. During the twelve million years of Miocene time and the first three millions of Pliocene time the record reveals a widely ranging anthropoid group, some pointing to modern anthropoids and all having the basic molar pattern and dental formula of man and the anthropoids. Hence, although fragmentary, the paleontologic record as it stands indicates the emergence of strictly human characters in the Pliocene *after* the *Dryopithecus* type of dentition had been the dominant one in Miocene times.

But, say the paleontologists, *Dryopithecus* or some allied genus may well be the ancestor of man, provided its foot, when discovered, shall show distinctly human specializations. Otherwise it is an ape and therefore excluded from ancestry to man. This raises again the crucial question, did man ever pass through an arboreal stage and what were its characters? Man belongs to an order, all the known members of which were completely adapted to arboreal life as far back as the Lower Eocene. With surprisingly few exceptions highly varied tree-shrews, lemuroids, cheiromyoids, tarsioids, New World monkeys, Old World monkeys, gibbons and great apes are thoroughly arboreal even at the present day, and only a few, such as the baboons and certain other monkeys, have more or less given up arboreal life for life on the plains. Hence, unless man can be shown to belong to an entirely distinct zoological order, the presumptive evidence is all in favor of the hypothesis that he too must be traced back eventually to an arboreal stock.

Long-continued life on the ground invariably results, so far as our experience extends, in specializations of the locomotor apparatus which the human skeleton has fortunately escaped. The retention of unimpaired pentadactyl extremities, of a claviculate shoulder girdle, of undiminished powers of supination of the hand and of a full complement of muscles of the limbs, all testify explicitly to the fact that man's ground-living adaptations are his latest acquisitions and that they have not continued long enough to wipe out many of the former arboreal characters which he still shares with his nearest relatives, the chimpanzee and the gorilla.

But there is even more direct evidence from many sources that underneath the bipedal habitus, acquired in several millions of years of adaptation to life on the plains, man still carries the plainest traces of an earlier arboreal mode of life. In a large number of characters of the brain, sense organs and viscera, man still agrees with the chimpanzee, gorilla, orang and gibbon, all fundamentally arboreal, brachiating bipeds. Moreover, the human fetus of the ninth week shows a widely divergent great toe, the under surface of the foot being provided with the interdigital and thenar pads of primitive aboreal primates. The thumb at this early stage has retained certain distinctly ape-like characters. In support of these statements I refer to the detailed descriptions of the early foetal hand and foot of man by Professor Schultz, of the Johns Hopkins University. And even the adult hand is remarkably similar in its anatomy.

The superficial unlikeness of the human foot to that of the chimpanzee and gorilla has been one of the principal difficulties for those who can not see the case for the arboreal origin of man. But the human foot itself is a veritable museum of relics of a former arboreal condition. The earliest known fossil primates of the exceedingly remote lower Eocene time already had a large and sharply divergent metatarsal of the great toe of the hind foot. The distal end of the hallux evidently bore a large flattened nail, while from the proximal end of the metatarsal sprang a large process upon which was evidently fastened the thick tendon of the peroneus longus muscle, a muscle of the utmost service in leaping and climbing. All known recent and fossil primates, including man, exhibit the same fundamental characters of the great toe, the principal difference being that in man this digit is brought around parallel to the other digits instead of being sharply divergent from them as it is in the foetus of the ninth week. It is also twisted around its own axis so that it faces downward toward the ground, whereas in the foetus of the ninth week its volar surface is turned partly inward toward the other digits, as in the tree-climbing anthropoids. The transversus and adductor hallucis muscles of the human foot, although differing in detail from those

of anthropoids, now assist in maintaining the transverse arch of the foot while in the anthropoids they served chiefly in the grasping action of the foot. The very dominance of the great toe in man was, as I interpret the evidence, the natural result of its derivation from an anthropoid stage in which the great toe was already enlarged and in which the main axis of weight of body passed on the inner side of the foot. Even the transverse ligament of the foot, which in the adult ties the great toe firmly to the others, in the foetus of the ninth week was evidently stretched so as to permit a wide cleft between the great toe and the other toes as in the anthropoid apes. These are only a few of the features in which the adult human foot differs in the proportional development of its parts as well as in its functions from the foot of the chimpanzee and the gorilla. In view of all this and of corroborative testimony from many other sources, can we any longer doubt that the human foot has been derived from an arboreal pro-anthropoid type by a change of function and by remodelling during its final stage of use on the ground?

Paleontologists have been dealing largely with races of mammals each of which from the Lower Eocene to the present time exhibits a progressive intensifying of a given function in a single direction. Comparative anatomy, on the other hand, affords numerous clear-cut cases of a change of function, involving sharp change in the direction of specializations. In the case of the flippers of seals and whales, for example, the comparative anatomist is fully convinced that in both cases the flippers have been produced by easily traceable modifications of enlarged hands of animals that were formerly terrestrial. And he may well stand by this inference, even though no fossil remains showing intermediate conditions between hands and flippers may have been discovered. So, too, comparative anatomists have long been satisfied that the human foot has been derived by a profound change of function from the arboreal grasping foot of primitive anthropoids. But the paleontologist, not so much impressed by experience with examples of the change of function, takes the stand that nothing of the kind can be proved except by fossils.

The astragalus is a bone which paleontologists find to be of high significance in classification. The order and even the family of most recent and fossil mammals may be determined by an attentive study of the astragalus. Here again the form of the human astragalus clearly suggests the place of man in the Primate order, not far removed from the chimpanzee and the gorilla. In this connection it is important to note that the astragalus of the Neanderthal race is slightly but distinctly more pithecoid in character than that of a modern man. And according to Dr. D. J. Morton's study of casts of several calcanea of Neanderthal man, this bone too contains some highly significant anthropoid features that are lost in later races of man.

The whole forearm of man affords the most cogent testimony to his relatively close relationships with the chimpanzee and greatly strengthens the evidence that man is derived from an arboreal brachiating ancestor. Here, however, a word of caution is necessary. All the existing species of apes are now over-specialized for arboreal life. Their hands are degenerating into hooks and their hind limbs are adopting more and more the suspension grasp which finally, as in the orang, makes them unfit to support the body in the upright position adopted by the gibbon and by the remote ancestors of man. These over-specialized arboreal characters have been advanced by many authors as an objection to the derivation of man from the anthropoid stem. But there is no need to impute them to the common man-anthropoid stock.

In conclusion then, during the past twenty years I have published a series of investigations on the classification and evolution of the vertebrates, dealing since 1916 especially with the origin of man, and during this period I have been unable to discover a single valid objection to the direct evidence afforded by comparative anatomy and in harmony with the paleontological record of the entire Primate order, so far as known, namely, that man's relatively close kinship with the chimpanzee and the gorilla is an unassailable fact; that he is a member of a group that, so far as known, first appears in the Oligocene epoch and is characterized originally by the erect position (as in the gibbons), by primitive brachiating arms, and by feet with divergent great toes; that of this group the existing anthropoids, remaining in the ancestral forests, became over-specialized in the direction of extreme brachiation, while the ancestors of man, left perhaps in a region of dwindling forests some seventeen million years ago, early in the Miocene epoch, spent more and more time on the ground and initiated an extensive series of changes in function, the results of which have partly masked the still more ancient and deeply impressed arboreal stamp upon the brain and sense organs and locomotor skeleton.

Paleontologists to date have brought forward no substantial evidence against this view. They cite the essentially human character of the Neanderthal and other fossil human races at a time perhaps ten million years and some 800,000 generations later than the real transitional period between apes and man. Disregarding the fact that of the many genera of Eocene tarsioids and lemuroids already known, none

rises even to the anthropoid grade of evolution, many paleontologists prefer to invent hypothetical unknown Oligocene and Eocene ancestors of man rather than to accept the highly varied Mid-Tertiary anthropoid stock as the common human-anthropoid source so precisely indicated by comparative anatomy and allied fields.

Refusing to accept even the paleontologic record so far as it is known, disregarding the cogent and direct evidence of comparative anatomy, many paleontologists do not hesitate to extend to man supposed laws of evolution deduced from the study of orders of mammals which in their entire organization and history stand in wide contrast to the primates. From such analogies has been conjured the Eocene Dawn Man—a colossal anachronism some forty million years ahead of his time in the world's history.

WILLIAM K. GREGORY

AMERICAN MUSEUM OF NATURAL HISTORY

SUTHERLAND SIMPSON[1]

WHEN I commenced work as a student of physiology in Edinburgh in 1899, Dr. Sutherland Simpson, having graduated in medicine that same year, had just been appointed an assistant in the department. Thus he was one of my first teachers in physiology. I already knew him well, for as natives of the same little county of Scotland and residing in the same university city we had frequently foregathered. It was a great feather in my cap to have made his acquaintance while I was a schoolboy there. Every Orcadian youth who came to study in Edinburgh knew at least something of his remarkable career, how from laboratory boy he had worked his way forward to a degree in science and had now set himself to qualify in medicine. In those days Simpson made a wonderful impression upon his associates. As one man put it, "When he walks into a room of people, with self-reliant step and head high, he carries an atmosphere with him. You recognize at once that there is a man." I did not know which to admire most—his abounding energy and virility or his unusual gift of sympathy and kindness.

On the remote island where he was born he had early decided on a career. That was not to become a physiologist, for he had never heard the word named. One day a Dundee whaling vessel with full spread of canvas approached and dropped anchor near his home. The sight of the captain standing solitary and with speaking-trumpet issuing peremptory orders, which, instantly obeyed, controlled every turn of the vessel, was a revelation to the youth, who had never before seen a man exercise what seemed to be boundless authority over his fellow men. Thenceforward Simpson had one ambition. That was to be master of a seagoing merchantman. To this he would bend all his energies.

The first thing was to acquire some higher education. Fortune here favored him. The school teacher, in order to escape from a contentious wife, started an evening school for the young men of the island. The main subject was navigation, but he also professed arithmetic, elementary mathematics and English composition. Simpson later discovered that he likewise knew French, but he had to extract the information, for the dominie was a poor expounder, and the evening school, as a commercial proposition that might have helped to temper the gibes of the wife, proved a complete failure. Very soon there was but one pupil left—Sutherland Simpson. This indomitable scholar stayed on month after month until he had been introduced to English literature, had read the whole of Voltaire's "Charles the Twelfth" in the original and had exhausted the store of mathematical knowledge of his instructor.

Years afterwards I chanced to meet a farmer who had known the Simpson family; as a young man he had sailed each summer on the herring-boat owned by Simpson's father. The father, a highly intelligent observer, placed his nets with such discrimination that the other fishing craft used to profit by merely watching and following the course that he took. So successful each year was the Simpson boat that there was keen competition among the young men to be numbered among the crew of that vessel. My informant, speaking of the son, who by this time had made his way in the world, said, "A most remarkable man is Sutherland Simpson, and he was that when he was a boy. When I sailed on his father's boat and we would be lying at the nets, the other fellows might be skylarking, playing the melodeon or dancing on the foredeck. But Sutherland Simpson would aye be sitting in the stern with a slate in his hand doing some calculation or other."

To carry out his cherished ambition Simpson left home at the age of sixteen and proceeded to Leith, his idea being to join a ship there. It was a time of great scarcity of work and he had to take a temporary job as a dock laborer. Sustaining an accident to his hand, he was incapacitated for some weeks. Meantime an advertisement in an evening paper announced that the department of physiology of Edinburgh University required a laboratory boy. On the strong solicitation of his landlady, a shrewd woman who had recognized his superior knowledge, he went

[1] Address delivered April 13, 1927, on the occasion of the presentation of a portrait of the late Dr. Sutherland Simpson to Cornell University.

at the appointed time to the university, where he found a queue of some seventy or eighty men, young and old, all applicants for the position. The professor sat in his room and interviewed the candidates, one after another. It is extraordinary to relate, but Simpson was selected for this menial position because of his unexpected knowledge of many things, and particularly of Macaulay's "Essay on Warren Hastings."

Here was an entirely new life for the would-be master of a sailing vessel. Thorough in everything he handled, Simpson applied himself with such effect that it was not long till he was promoted to be head technician. He designed and drew the charts, made the preparations for all the laboratory classes, assisted in all the experimental demonstrations given by the professor—which invariably broke down when Simpson was absent—and became wholly indispensable to the conduct of the establishment. At first he attended night school, then he took evening science lectures in the Heriot-Watt College, studied physics, chemistry, botany, zoology and bacteriology. His laboratory duties became increasingly hard, for the more efficiency he displayed the more work was loaded upon him.

In those days he roomed with a fellow countryman of habits and ambition similar to his own. This roommate drove a brewer's lorry, and, just as Simpson in the laboratory would snatch an odd moment to study chemistry, English, Latin or mathematics, so the lorry driver, perched on a sack behind his team of horses, would con over books on corresponding subjects. The working hours were long. The lorryman started at six in the morning and unyoked at six at night. Simpson went on duty at eight and was not free till nearly seven. Nevertheless the two men at the end of their twelve hours' day went regularly to night classes, and ended up the long evening in free discussion of the subject-matter of the lectures. In due time both entered their names for a South Kensington Science and Art Scholarship. These scholarships, no longer in vogue, played quite an important educational rôle in their day. They had been promoted chiefly by Thomas Huxley in order to assist just such people as we speak of. Out of the whole city of Edinburgh Simpson and his companion were the only two night students who were that year successful.

The lorry driver proceeded to London, where he graduated in agriculture. Not long afterwards he became professor of agriculture in one of the English universities, and later, director of agriculture to a whole country. Simpson meant also to go to London, but his chief interposed. "Quite impossible! How could he ever desert the laboratory without giving adequate notice and opportunity for training a successor?" The chief, who knew the examiners, would see that he got a scholarship next year. It was a heartbreak to Simpson, who, with his great aversion to inconveniencing other people, allowed himself to be persuaded against his better judgment and to stay on for another year. To prepare for his departure a regular succession of laboratory apprentices was engaged. Each novitiate would serve for a month or two and, proving unsuitable, would get his discharge, that is to say, if he had not previously resigned of his own accord. Simpson's chief was of an overbearing nature, and only a servant with the consideration and tact and (may I add) with the restless ambition of Sutherland Simpson, would have consented to hold the position so long as he did. It is credibly asserted that on one occasion Simpson, with his superior physical knowledge, intervened just in time to save the chief from propounding an untenable theory before an important scientific gathering. As the result of criticism by his laboratory technician the advertised communication of the departmental head was hurriedly withdrawn. I can not vouch for the truth of the story but I do vouch for its possibility. Certain it is that all Simpson's efforts toward self-education and independence were viewed with disapproval by the professor of physiology, and at the end of his year he was informed that his departure was out of the question. He could not then help himself, because he had forfeited the scholarship that would have made him independent.

His next move was to enter for a B.Sc. degree in the university. It was useless to request any hours of exemption from laboratory duty during the day; he could qualify only by attending extramural classes at night. His plan was frowned upon, but Simpson had resolution and determination quite equal to that of his superior in command, and in due time he took the degree. By now he had decided upon a career in physiology, and to that end he entered the medical school. I need scarcely stress the financial difficulty involved in such a project. It absorbed all his savings. He gave up his laboratory appointment, and each summer took his place as a herring fisher in his father's boat. It was at this stage of his career that I first came to know Simpson, and my outstanding recollection of him apart from his superabundant energy is his kindliness, his sympathy for others. Not a word of his difficulties, not a whisper of disappointment or of bitterness; instead of that a humorous, even joking attitude towards obstacles, and a catholic outlook on human affairs.

So soon as he graduated he entered his old department as a qualified assistant under a new chief, Sir Edward Sharpey Schafer, who, knowing his exceptional history, was filled with respect for him. Simpson had now to some extent come into his own. It

was in order to teach his chosen subject and to engage in research work in physiology that he had, after dropping his idea of a nautical career, devoted so many patient and laborious years to study. His first research work won for him a gold medal on his graduation as doctor of medicine. Later he added the D.Sc. degree to his other academic distinctions, and was elected a fellow of the Royal Society of Edinburgh. During this period he engaged, partly by himself, partly in collaboration with others, in a large amount of research work, on the cortico-spinal tracts, on the minute structure of the liver, on the body temperature of vertebrates and on temperature regulation in bird and mammals, on the secretion of bile and of pancreatic juice, and on certain aspects of endocrinology. In 1908 he was appointed to fill the reconstituted chair of physiology and biochemistry in Cornell University, where in 1920 he was made World War Memorial professor of physiology.

Simpson had a happy time in Cornell. With his gift for making friends he was very soon at home in his new surroundings. The pleasurable excitement with which he surveyed the field on arrival, the joy he felt in being at last wholly independent, the interest he took in his new university and in his associates, are recorded in numerous letters to his acquaintances. He had now attained the command for which he had schooled himself. He was at last in charge of his ship; and under his skilful navigation and constructional superintendence she became the tight and handy vessel that for eighteen years was to outclass many of her heavier rivals. Simpson dearly loved a race, and whether he was in an actual sailing craft (any one who ever witnessed his control over a sailboat conceived a new respect for him) or whether he was running his laboratory, he spread every stitch of canvas and utilized every inch-ounce of available motive power. His classes increased in numbers and in popularity. He trained and sent out many physiologists, who are attached to him by ties of sincere respect and regard. His laboratory grew steadily in resources and in equipment, until it is now left as a unique heritage to his successor. Above all he brought his department into the forefront of research activity, the Cornell work, especially on thyroid and on parathyroid problems, being now familiar to all physiologists and to a large circle of medical men.

Simpson was the real scientist, but it was not his scientific qualities alone which made him great. If we may number them, he had two outstanding additional characteristics. First of all, he was essentially a scholar, and a scholar of wide range. Despite early handicaps that might have deterred a more timid or more indolent man, he had sought out for himself much of the best and greatest wisdom contained in books. His range included the classics of antiquity, early Icelandic literature, Russian, French and German literature, to which must be added a wholly unusual acquaintance with the greatest writers in our own language. He had, what we scientific people so frequently miss, a historically cultivated mind; and his interest in all these things was to an uncommon degree of that unselfish kind which made him long to share his literary experiences with others. Every one who knew him will remember the eager, almost solicitous, enthusiasm with which he proclaimed his discovery of a new book revealing some striking conception or original outlook. His extensive acquaintance with literature gave him balance and markedly enhanced his other characteristic, which was his *humanity*.

Of this I find it difficult to speak. The man who had spent his life in obstinate battle with difficulties, in resolute domination over circumstance, was the kindliest and most considerate of men, the first to proffer help to others in their discouragements. When he gave help, as he was constantly doing, he gave of his unstinted best. To the end he lost none of his honest and openly expressed contempt for the untruthful or the mean, in whatever guise they might appear, but his judgment of individuals was invariably broad and catholic, never vindictive. I do not believe he had a single enemy, which is a strangely illuminating statement to make of a man of Simpson's strength of character. His life is a great lesson to us, which we can contemplate only with feelings of wonder, of humility and of admiration.

JOHN TAIT

MCGILL UNIVERSITY

SUMMER SCHOOLS FOR ENGINEERING TEACHERS

As recently announced, the Society for the Promotion of Engineering Education has undertaken an experiment in the training of college teachers of engineering through the establishment of summer schools to be conducted by the Society at Cornell University and the University of Wisconsin during July, 1927. The purpose of the schools will be the discussion and study of methods of teaching the basic subjects of the engineering curriculum. For the first year the subject of mechanics has been selected because of its fundamental importance and its pivotal position between the work in mathematics and physics and the study of the engineering subjects proper. Mechanics was chosen also because all engineering teachers have a working knowledge of it and consequently will be able to appreciate discussions of

methods of teaching in general when the discussions apply to this particular subject.

The teaching staffs of the two schools include many of the most able and prominent teachers of engineering in the country. Those who have accepted invitations to serve are as follows: Dean Dexter S. Kimball, of the College of Engineering, Cornell University, will serve as director of the Cornell session. Dean Kimball is a past president of the American Society of Mechanical Engineers, is at present president of American Engineering Council, and is an authority in the fields of machine design and industrial management. Lecturers on the subject of mechanics at the Cornell session include Professor J. E. Boyd, of Ohio State University, the author of a standard textbook on mechanics; Professor W. S. Franklin, of the Massachusetts Institute of Technology, whose books on mechanics, physics and mathematics are extensively used, and Professor E. W. Rettger, of the Department of Mechanics of Cornell University.

Teachers of subjects related to mechanics include Professor C. M. Allen, of Worcester Polytechnic Institute, an authority on hydraulic engineering; Professor Vladimir Karapetoff, of Cornell University, an expert in the field of electro-mechanics; Dean Milo S. Ketchum, of the College of Engineering, University of Illinois, author of works on structural engineering; and Stephen Timoshenko, research engineer of the Westinghouse Electric and Manufacturing Company, and lecturer at the University of Pittsburgh.

Professor G. B. Upton, of the Cornell faculty, will serve as lecturer on experimental courses in mechanics, and G. A. Works, Professor of Rural Education and chairman of the University Division of Education, will serve as educational adviser and critic. Professor C. L. Walker, of the Department of Civil Engineering and Secretary of the Faculty of the College of Engineering, will act as secretary of the school and will edit the "proceedings."

The Wisconsin session will be conducted under the directorship of Professor E. R. Maurer, chairman of the Department of Mechanics of the University of Wisconsin. Professor Maurer is an authority on strength of materials and the principles of reinforced concrete construction. Other members of the staff who will deal with the subject of mechanics include Professor A. P. Poorman, of Purdue University, and Professor S. M. Woodward, of the State University of Iowa. Professor Poorman is the author of "Applied Mechanics" and "Strength of Materials," books which have a large circulation in American engineering colleges. Professor Woodward has served as consulting engineer on many important projects including the flood prevention work of the Miami Conservancy District at Dayton, Ohio. Teachers of laboratory courses include Professor H. F. Moore, of the University of Illinois, and Professor W. O. Withey, of the University of Wisconsin. Professor Moore is an authority on the fatigue of metals and on the history and philosophy of mechanics. Professor Withey's best known work is the comprehensive revision of Johnson's "Materials of Construction." He is also an authority on methods of testing materials and laboratory procedure.

Teachers of subjects related to mechanics include Professor Edward Bennett, chairman of the Department of Electrical Engineering at the University of Wisconsin, co-author with H. M. Crothers of "Introductory Electro-dynamics for Engineers"; O. A. Leutwiler, professor of mechanical engineering design at the University of Illinois and author of numerous works on machine design and power plant machinery; C. S. Slichter, Dean of the Graduate School of the University of Wisconsin; Dr. Stephen Timoshenko; and F. E. Turneaure, Dean of the College of Engineering at the University of Wisconsin. Dean Turneaure is an authority on structural engineering, a member of the State Highway Commission of Wisconsin, consulting engineer, and member of numerous technical committees of the American Society of Civil Engineers. Professor E. M. Terry, of the Department of Physics at the University of Wisconsin, will deal with instruction in elementary mechanics and with lecture demonstration methods. Professor Curtis Merriman, of the School of Education of the University of Wisconsin, will act as educational adviser and critic. Leslie F. Van Hagan, professor of railway engineering, will serve as secretary of the conference and will compile the "proceedings."

Applications to attend the schools are being received in large numbers at the New York Office of the Society for the Promotion of Engineering Education, 33 West 39th Street. It has been necessary to close the registration of the Cornell session of the schools since the maximum number which can be accommodated has been reached.

The plan for conducting the schools contemplates two or three sessions daily. Morning sessions will include formal lectures on mechanics and related subjects and on methods of teaching, demonstration-lectures, laboratory demonstrations, and model teaching. The afternoon sessions will be devoted largely to seminars in small groups and to assigned projects on the preparation of class exercises and lectures, the devising of problems, the setting of examinations, and the planning of experiments. These projects will be prepared in written form and transmitted to the entire group for discussion and criticism. The prin-

ciples of education and methods of teaching will be emphasized in all of the work. Lectures will be delivered by prominent speakers during the evening on topics of general interest to engineering educators. These will include a wide range of subjects of current importance. The program also includes a number of recreational features, since both Ithaca, New York, and Madison, Wisconsin, provide exceptional opportunities for pleasant diversions.

The summer schools are being conducted by the Society for the Promotion of Engineering Education under the general supervision of its Board of Investigation and Coordination, of which Professor Charles F. Scott, of Yale University, is chairman, and Dean F. L. Bishop, of the University of Pittsburgh, is secretary, and under the immediate direction of Dr. W. E. Wickenden, Director of the Society's general investigation of engineering education, and Professor H. P. Hammond, associate director of the investigation. The Engineering Foundation, of which Mr. Alfred D. Flinn is the director, is associated with the enterprise and is acting as treasurer for the holding of the special funds under which the present stage of the investigation is being prosecuted. The summer schools are financed by a special appropriation for the purpose made by the Carnegie Corporation of New York.

SCIENTIFIC EVENTS

THE LEEDS MEETING OF THE BRITISH ASSOCIATION[1]

THIS year's meeting of the British Association will be held at Leeds from August 31 to September 7, under the presidency of Sir Arthur Keith. In returning to the county of its origin—the first meeting was held at York in 1831—the association will be in the midst of a district of great scientific interest. Leeds, in fact, is a convenient center from which to visit places rich in archeological, geological and botanical material, and arrangements are being made to enable members to make excursions to the Yorkshire abbeys, the limestone country, and the moors.

The association has met at Leeds on two previous occasions. The first visit was in 1858, when the president was Sir Richard Owen. In these days, when direct speech by wireless across the Atlantic has been achieved, it is interesting to recall that at the Leeds meeting in 1858 the president announced that a telegraphic cable had been successfully laid between England and America, and the first messages of goodwill between the nations had passed only a few days before. The second meeting in Leeds was in 1890, and was presided over by Sir Frederick Abel.

[1]The London *Times*.

The preliminary program of this year's conference shows that the inaugural general meeting will take place on August 31, when Sir Arthur Keith will assume the presidency in succession to the Prince of Wales and will deliver an address on "Darwin's Theory of Man's Descent as it stands To-day." There is no alteration in the number of sections, which remains at thirteen. The sections, with their presidents, are as follows:

A.—Mathematical and Physical Sciences.—Professor E. T. Whittaker, F.R.S.
B.—Chemistry.—Dr. N. V. Sidgwick, F.R.S.
C.—Geology.—Dr. Herbert H. Thomas.
D.—Zoology.—Dr. G. P. Bidder.
E.—Geography.—Dr. R. N. Rudmose Brown.
F.—Economics.—Professor D. H. Macgregor.
G.—Engineering.—Professor Sir James B. Henderson.
H.—Anthropology.—Professor F. G. Parsons.
I.—Physiology.—Dr. C. G. Douglas, F.R.S.
J.—Psychology.—Dr. W. Brown.
K.—Botany.—Professor F. E. Fritsch.
L.—Education.—The Duchess of Atholl, M.P.
M.—Agriculture.—Mr. C. G. T. Morison.

Among the subjects of the sectional presidential addresses will be "The Broadening of the Outlook in Education," by the Duchess of Atholl; "The Englishman of the Future," by Professor F. G. Parsons; "Rationalization of Industry," by Professor D. H. Macgregor; and "Agriculture and National Education," by Mr. C. G. T. Morison. Two evening lectures to members have been arranged, one by Professor R. A. Millikan, of the United States, on "Cosmic Rays," and the second by Dr. F. A. E. Crew on "The Germplasm and its Architecture."

A feature of the meeting will be the extension of the principle of public lectures in Leeds and the neighboring towns. Leeds, as the center of a large number of other towns, gives the association an opportunity of arranging for lectures by leading scientists in towns where they may be desired, and some twenty such lectures will be provided. An innovation will be the inclusion in the program of the meeting of a number of communications on various scientific researches relating to the textile industries. The British Research Association for the Woolen and Worsted Industries, the Department of Textile Industries in the University of Leeds, and the Textile Institute of Manchester have cooperated with the British Association in the arrangement of this part of the program. The laboratories of the Research Association at Torridon and of the university department will be inspected and a special meeting room will be set apart for papers on textile subjects.

The excursions, which have been arranged, will include visits to Byland Abbey, Helmsley Castle, and Rievaulx, which will be conducted by Mr. C. R. Peers,

chief of the Ancient Monuments Inspectorate of H.M. Office of Works. The Yorkshire Ramblers Club is arranging for small parties of members to make the descent of Gaping Ghyll. Arrangements will also be made for visits to the principal works and factories in and near Leeds.

OHIO GEOLOGISTS' FIELD TRIP

THE annual field trip of the geological section of the Ohio Academy of Science was conducted by Wilbur Stout, of the Ohio Geological Survey, in the Portsmouth-Pomeroy region of southern Ohio on May 28, 29 and 30. With a registration of forty-five, the excursion was one of the most largely attended field trips in the recent years of the section's activity.

During the progress of the excursion, the party visited outcrops of the Waverly and Maxville Series of the upper Mississippian System and the Pottsville, Allegheny, Conemaugh and Monongahela Series of the Pennsylvanian, giving opportunity for both fossil collecting and stratigraphic study. The notable physiographic features of the region—the old Teays river valley, and other recently abandoned drainage systems, the upper peneplain level, and the evidence for intermediate erosion stages—were examined by members of the party. Clay pits and mines were visited at Sciotoville, Scioto Furnace, and Oak Hill; coal mines near Jackson and at Pomeroy; and salt works at Pomeroy. One of the most enjoyable features of the excursion was a starlight steamboat ride on the Ohio River at Pomeroy on the specially chartered "Champion III."

Among the institutions represented were: Antioch College, Cincinnati University, Marietta College, Miami University, Muskingum College, Ohio Geological Survey, Ohio State University, Ohio Wesleyan University, Toledo University, the East Ohio Gas Company and the Jackson Coal Company.

A. C. SWINNERTON
VICE-PRESIDENT FOR GEOLOGY,
OHIO ACADEMY OF SCIENCE

THE ARNOLD ARBORETUM

IN order that the Arnold Arboretum at Jamaica Plain, which contains the greatest collection of hardy trees and shrubs in the United States, may be perpetuated and enlarged, friends of the late Professor Charles Sprague Sargent are raising a fund to continue its work. The Boston committee formed to raise the Charles Sprague Sargent Memorial Fund for the endowment of the Arnold Arboretum announces that up to June 10 the sum of $460,820 has been received toward the $1,000,000 fund considered necessary to carry on this work.

In less than three months since Professer Sargent died on March 22 nearly half of the fund has been subscribed by those most deeply interested in the arboretum's future, principally by friends in Boston. A national committee and other local committees are now being formed throughout the country so that nature-lovers everywhere may have an opportunity of contributing to the garden, which contains more than 6,500 species and varieties of trees and shrubs.

Sargeant was Arnold professor of aboriculture at Harvard University and director of the arboretum for fifty-four years, and he planned and created it as an artist works out a picture, personally directing the planting of its trees and shrubs. Through an agreement made in 1872, the president and fellows of Harvard College became trustees of a bequest of $100,000 left by one James Arnold, a New Bedford merchant, which it was decided should be used for the development of trees. The Harvard trustees provided as a site for the garden some 125 acres of property in West Roxbury, bequeathed to Harvard by Benjamin Bussey.

Frederick Law Olmsted, Sr., when planning a park system for Boston, suggested that the arboretum's land become part of that system. The city agreed to build roads throughout the arboretum and maintain them and to protect it with its police, and the president and fellows agreed to keep the arboretum open every day in the year from sunrise to sundown. This arrangement has given to the arboretum all the advantages of perpetual ownership of the land it occupies and has relieved it of heavy financial burdens. Additions of land have been made until the arboretum now has an area of 250 acres. Professor Sargent built up a library at the arboretum to which, it is said, no similar collection outside the British Museum can be compared. He did this largely at his own expense, and made generous financial contributions through all the years of which there is no complete record. The arboretum's average expenditure during the last five years has been $80,000, with a tendency to rise, and its present income from endowment is not more than $60,000.

AWARDS FOR RESEARCH AT CORNELL UNIVERSITY

THIRTY-TWO members of the Cornell Faculty will receive awards from the Heckscher Fund to carry on scientific and scholarly research next year. This fund, established by August Heckscher, of New York, several years ago, amounts to $50,000 annually and is devoted to research work in various fields.

A faculty committee, of which Dean R. A. Emerson of the Graduate School is chairman, has agreed upon the awards and they will be ratified by the Board of

Trustees. The amounts given vary in accordance with the needs and the merits of the work. The awards for research in the natural and exact sciences follow:

Professor Louis M. Dennis, two awards, supplementary to grants already made to assist in chemical research.

Professors William R. Orndorff and Roswell C. Gibbs, for a study of the absorption spectra of organic compounds.

Professor Albert H. Wright, for an investigation of the life history of the North American frog.

Professor Arthur W. Browne, for an assistant, for the study of azidodithiocarbonic acid and its derivatives.

Professors Veranus A. Moore and Charles M. Carpenter, for a study of undulant fever.

Professor Jacob Papish, for a study of spectroscopy of the rarer elements.

Professor Morris A. Copeland, for statistical investigation of monetary theory.

Professor Roswell C. Gibbs, for an assistant in research on the series of radiation doublets of stripped atoms of the potassium type.

Professor Frederick G. Switzer, for employing an assistant in the study of a rational method of determining the probable flood flows of rivers, and a study of cycles and periodicities of normal river flow.

Professor Robert Matheson, for a study of culicid ecology.

Professor James C. Bradley, for a taxonomic study of the Vespidae.

Professor Oskar A. Johannsen, for drawings necessary to illustrate a paper on the embryonic development of the arctiid moth.

Professor John I. Hutchinson, for the salary of an assistant, to spend part of his time on the study of the properties of functions defined by certain Dirichlet series.

Professor Arthur Ranum, for an assistant, to spend part of his time on the study of the principle of duality in the differential geometry of surfaces and sted curves.

Professor Karl M. Dallenbach, for the study of nerve regeneration.

Professor A. A. Allen, for the artificial propagation of the canvasback and other diving ducks.

Professor Herbert H. Whetzel, for an assistant, to spend part of his time in taxonomic studies in the general Sclerotinia and Botrytis.

Professors Hugh D. Reed, Allen Frazer and George C. Embody, for genetic studies and related problems in fishes.

Professor Loren C. Petry, for the collection of fossil plant material from the middle Devonian formation of Gaspe Basin, Quebec.

Professor Peter W. Claassen, for research work on the taxonomy and biology of the immature stages of the Plecoptera of North America.

Professor Ernest Merritt, for a study of the influence of condition in the upper air upon the transmission of electric waves.

Professor Rollin A. Emerson, for a study of the mode of inheritance of certain characteristics in the honey bee.

Professor James B. Sumner, for the study of the enzyme urease.

Professors Edward L. Nichols and Ernest W. Merritt, for the investigation of luminescence of inorganic substances.

SCIENTIFIC NOTES AND NEWS

DR. HENRY PAUL TALBOT, professor of analytical chemistry for thirty-five years in the Massachusetts Institute of Technology, died in Boston on June 18, aged sixty-three years.

BROWN UNIVERSITY at its recent commencement conferred the doctorate of laws on Dr. William Louis Poteat, president of Wake Forest College, Wake Forest, N. C., and on Dr. Michael Idvorsky Pupin, professor of electro-mechanics at Columbia University.

LEHIGH UNIVERSITY has conferred the degree of doctor of science on Dr. William D. Coolidge, of the General Electric Company, and of doctor of engineering on Dr. Elmer A. Sperry. The commencement address was delivered by Dr. Michael I. Pupin.

WESLEYAN UNIVERSITY conferred the degree of doctor of science on Dr. Edward L. Rice, professor of biology in Ohio Wesleyan University and on Dr. Charles L. Beach, president of the Connecticut Agricultural College.

THE doctorate of science has been conferred by the University of Pennsylvania on Arthur Webster Thompson, engineer, president of the United Gas Improvement; George David Rosengarten, manufacturing chemist, president of the American Chemical Society; Henry Sturgis Dennison, of Framingham, Mass., manufacturer and leader in industrial research; John Ripley Freeman, of Providence, R. I., hydraulic engineer; Dr. Josiah Calvin McCracken, dean of the Medical School of St. John's University, Shanghai, and Dr. Charles Williamson Richardson, of Washington, otolaryngologist.

AT Colgate University the degree of doctor of science was conferred on Dr. Frank Earl Williams, editor of *Mental Hygiene*, and on Dr. George Hoyt Whipple, dean and professor of pathology in the school of medicine and dentistry of the University of Rochester. The doctorate of laws was conferred on Mr. Gerard Swope, president of the General Electric Company.

JOSEPH S. ILLICK, state forester of Pennsylvania, received the honorary degree of doctor of science at the commencement exercises of Lafayette College.

THE honorary degree of doctor of science has been conferred on James M. Bartlett by the University of Maine, in recognition of forty-two years of con-

tinuous service as chief chemist of the Maine Agricultural Experiment Station.

The program of the twelfth assembly of the Czechoslovak Academy of Agriculture, held at Prague on June 11, included a celebration of the seventieth birthday of Dr. L. O. Howard, chief of the Bureau of Entomology of the U. S. Department of Agriculture. The address was made by Dr. Frantisek Rambousek, who referred to Dr. Howard's successful activities for the benefit of the agriculture of the whole world.

Dr. Edward R. Baldwin, Saranac Lake, director of the Trudeau School of Tuberculosis, was awarded the Trudeau Medal at the twenty-third annual convention of the National Tuberculosis Association. The medal was presented by Dr. Theobald Smith, the only other person to whom the Trudeau Medal has been awarded.

Dr. Edward Dean Adams, electrical engineer of New York City, has been appointed delegate of the Engineering Foundation to the celebration of the five hundredth anniversary of the founding of the University of Louvain, on June 28.

We learn from the *Journal* of the American Medical Association that the staff of St. Elizabeth's Hospital gave a dinner in honor of Dr. William A. White, the superintendent, May 13, as an expression of mutual good-will and friendliness between the superintendent and the staff, and of their confidence in and loyalty to the hospital and its management. St. Elizabeth's Hospital has been recently the subject of various investigations by the congress. The dinner was an expression of the relief afforded by the end of the investigations and their favorable results.

Honors conferred by King George on the occasion of his birthday on June 3 include the following: *Order of Merit:* Sir Charles Parsons, in recognition of his eminent services in scientific research and its application to industries. *G.B.E. (Civil Division):* Sir Frank Heath, until recently secretary to the Department of Scientific and Industrial Research, and Sir Richard Threlfall. *Knights:* W. G. Lobjoit, until recently controller of horticulture, Ministry of Agriculture, and Professor C. J. Martin, director of the Lister Institute, London.

Dr. E. D. Merrill, dean of the College of Agriculture of the University of California, has accepted the position of director of the California Botanical Garden, at Los Angeles, to which he will devote part of his time. Dr. W. L. Howard, director of the branch of the College of Agriculture at Davis, has been appointed associate dean, to assist in the affairs of the college during Dean Merrill's temporary absences and T. F. Tavernetti, assistant to the dean, has had his powers amplified to care for the routine work of the college.

Dr. W. W. Lepeschkin, of Prague, has been appointed visiting professor of plant physiology at Washington University, St. Louis, and physiologist to the Missouri Botanical Garden.

Professor Eugene Fischer, the anatomist of Freiburg, has been appointed director of the Kaiser Wilhelm Institute for Anthropology at Berlin, which is to be opened in September on the occasion of the International Congress on Heredity.

Dr. Mortimer E. Cooley has resigned as dean of the department of engineering of the University of Michigan.

Dr. Elmer V. McCollum, of the Johns Hopkins University, was elected president of the American Society of Biological Chemistry, and Dr. D. Wright Wilson, Philadelphia, secretary, at the recent annual meeting in Atlantic City. The next annual meeting will be held at Ann Arbor, Mich.

Rudolf Meyer, Henry Phipps professor of psychiatry in the Johns Hopkins University Medical Department and director of the Phipps Psychiatric Clinic, Baltimore, was elected president of the American Psychiatric Association at the annual meeting held in Cincinnati on June 3, and Dr. Earl D. Bond, Philadelphia, secretary. The next meeting will be held at Minneapolis in 1928.

The following officers were elected at the annual meeting of the Southern Branch of the Society for Experimental Biology and Medicine held at Tulane University on the evening of May 19: *President,* Irving Hardesty; *Vice-president,* John H. Musser; *Secretary,* Henry Laurens, all of Tulane University.

At the annual meeting of the Harvey Society (New York) the officers elected were: *President,* Donald D. Van Slyke; *Vice-president,* James W. Jobling; *Secretary,* Carl A. L. Binger; *Treasurer,* Haven Emerson; *Members of Council,* Russell L. Cecil, Walter J. MacNeal, David Marine.

Dr. Thomas D. Cope, professor of physics at the University of Pennsylvania, has been elected president of the Pennsylvania chapter of the Sigma Xi, succeeding Professor William H. Addison.

Announcement was made at the Seventh Regional Meeting of the Midwest Sections of the American Chemical Society, at Chicago on May 27 and 28, that Professor H. A. Schuette, of Wisconsin, and Professor C. H. Bailey, of Minnesota, had been elected chairman and secretary, respectively, of the next meeting which will be held at Minneapolis in 1928.

AT the recent anniversary meeting of the Linnean Society of London, the following were elected officers of the society for 1927–28: *President,* Sir Sidney F. Harmer; *Treasurer,* Mr. H. W. Monckton; *Zoological Secretary,* Dr. W. T. Calman; *Botanical Secretary,* Mr. J. Ramsbottom. The Linnean gold medal was presented to Dr. Otto Stapf, in recognition of his contributions to the advancement of botanical science. The Crisp award and medal were given to Dr. H. Graham Cannon, professor of zoology at Sheffield University, for his paper "On the Post-Embryonic Development of the Fairy Shrimp," published in the journal of the society.

AN award of $2,000 from the Shaler Memorial Fund has been made to Professor Louis C. Graton, professor of mining geology at Harvard University, to aid his research work in the mines of Africa next year. Professor Graton has been granted a sabbatical year and, backed by the Bureau of International Research, has formed plans to study rocks and ore formations in the world's deepest mines in Brazil, South Africa and India. The Shaler award by Harvard University is specifically for the study of copper deposits in the Belgian Congo and Rhodesia.

DR. E. V. COWDRY, of the Rockefeller Institute for Medical Research, who has been working in the Pasteur Institute at Tunis, expects to return early in July.

PROFESSOR PAUL LANGEVIN, of the Sorbonne, Paris, will be on the staff next winter of the California Institute of Technology lecturing on "Theories of Magnetism."

GEODESISTS from about twenty-five countries will meet at Prague, Czechoslovakia, the latter part of August and the first week of September of this year to attend the third general assembly of the International Geodetic and Geophysical Union. The United States will be represented by Dr. William Bowie, chief of the Division of Geodesy, and Mr. Walter D. Lambert, mathematician of that division, of the Coast and Geodetic Survey. Dr. Bowie and Mr. Lambert have been appointed by the president of the National Academy of Sciences and the chairman of the National Research Council as delegates from the United States and by the assistant secretary of commerce as representatives of the United States Coast and Geodetic Survey.

The Harvard Graduate Magazine reports by cable from George C. Shattuck, M.D., '05, that the Tropical Medicine African expedition, of which he is a member and of which Dr. Richard P. Strong is the head, has finished its work in Africa successfully and that they expect to sail from Mombasa for this country on June 8. A great deal of material has been collected for study after their return.

DR. PAUL BARTSCH, curator of mollusks in the National Museum, is going to the Matamek River on the south coast of Labrador for the study of mollusks.

PROFESSOR GEORGE KEMMERER, of the University of Wisconsin, and Dr. Willis H. Rich, of the U. S. Bureau of Fisheries, have left for Kodiak Island, Alaska, where they will spend the summer in making a scientific study of the water of the lakes on the island.

DR. LEUMAN M. WAUGH, professor of orthodontia at the Columbia School of Dental and Oral Surgery, will sail on June 28 to Northern Labrador and the Ungava Bay region to carry on his researches with the Eskimo tribes which he is conducting under the auspices of the university.

DR. HARRY E. MOCK, of Northwestern University Medical School, and Dr. W. M. Blanchard, head of the department of chemistry at De Pauw University, were the principal speakers at the exercises commemorating the laying of the corner-stone of the new science building built at Franklin College, Ind., at a cost of $200,000. This building will house the departments of physics, zoology, botany and chemistry.

PROFESSOR J. H. MATHEWS, of the University of Wisconsin, gave the dedicatory address on the occasion of the formal opening of the Kedzie Chemical Laboratory of Michigan State College on "Recent Developments in the Field of Chemistry."

DR. LEON COLLETT, professor of geology in the University of Geneva, will be one of the Spencer Trask lecturers at Princeton University next year.

PROFESSOR RODNEY H. TRUE delivered the address at the annual joint meeting of the Pennsylvania chapters of Phi Beta Kappa and Sigma Xi on June 8. His subject was "Episodes in the Life of the Prehistoric Farmer."

THE Canadian Historical Association has erected a monument on the grave of David Thompson, "the greatest land geographer the world has known," in Mount Royal Cemetery, Montreal.

DR. VIRGIL PENDLETON GIBNEY, formerly professor of orthopedic surgery in the College of Physicians and Surgeons of Columbia University, died on June 16, aged eighty years.

WILLIAM CARLETON WILLIAMS, professor of chemistry at the University of Sheffield from 1883 until 1904, died on May 25.

DR. VIKTOR ROTHMUND, professor of physical chemistry in the German University at Prague, died on May 10, at the age of fifty-seven years.

PROFESSOR EDOUARD BRUCKNER, known for his work on meteorology and geology, died at Vienna on May 21, aged sixty-four years.

TENTATIVE plans are now being made for the meeting of the section of psychology of the American Association for the Advancement of Science at Nashville, from December 26 to 28. This will allow members also to attend the meeting of the Psychological Association at Columbus the latter part of the week. There will be one or more joint sessions with Section Q, including probably a session on educational psychology and possibly an evening session at which the two vice-presidential addresses will be delivered. Still other organizations may be represented.

THE New York State Geology Association held its third field meet on May 6 and 7 at Vassar College, Poughkeepsie, N. Y. Departments of geology of about ten colleges and universities were represented. The first day was devoted to a study of the Ordovician rocks east of Poughkeepsie. Several outcrops of the Precambrian were also seen. On Friday evening a general conference was held dealing with the geology of that district. On Saturday the party visited the rocks on the west side of the Hudson, making the trip by means of motor busses to New Platz, Rosendale, High Falls and Binnewater. Professor Heinrich Ries, of Cornell University, was elected president for next year. Dr. H. L. Alling is secretary. The association plans to visit Cornell University next May.

THE first World Population Conference will be held in the Salle Centrale, Geneva, Switzerland, from August 31 to September 2, to consider the question of population growth from an international point of view. Among the subjects to be discussed are population and the food supply; the biology of population growth; optimum density; the differential birth rate; migration and its control and fertility and sterility in relation to population. Sir Bernard Mallet is chairman of the council of the conference, which includes about twenty-four scientific men from France, England, Germany, Australia, Holland, Switzerland and the United States, the members from the United States being Drs. William Whitridge Williams, Raymond Pearl, Wesley C. Mitchell, Clarence C. Little, Henry P. Fairchild and Edward M. East.

THE Sixth International Congress of the History of Medicine will be held at the University of Leiden, Amsterdam, from July 18 to 23, under the patronage of the Prince of the Netherlands, and with a number of government officials as honorary presidents. There will be a visit to the exposition of physical instruments made by Dutch scientists in the eighteenth century, and moving picture illustrations of researches of Van Leeuwenhoek and Swammerdam; a visit to The Hague and Scheveningen; a reception by the Society of Physicians of The Hague; a visit to the medico-historic exposition of the Museum Suasso, and a reception by the mayors and municipalities of Amsterdam and Leiden. Among the speakers will be Drs. Crommelin and Nuijens. Dr. J. G. De Lint is president of the executive committee.

ON June 9 the Brooklyn Botanic Garden received a gift of $10,000 from Mr. and Mrs. Walter V. Cranford, of Greenwich, Connecticut, to be used for the construction of a Rose Garden. Work has already been commenced. The suggestion for this gift came to Mr. Cranford while reading the sixteenth annual report of the Brooklyn Botanic Garden, which contained a reproduction of the landscape architect's design.

THE first psychological laboratory at Western Reserve University has been opened. The building contains a seminar room, a class room holding approximately 50 students, twelve individual experiment rooms, library, offices, dark rooms, shop and storage room, and is equipped for work on any experimental problems within the field of human psychology. The work to be undertaken includes both undergraduate and graduate instruction, and investigations by or under the direction of the staff. This staff at present consists of Professor Herbert Austin Aikins, Assistant Professor James Quinter Holsopple and Assistant Professor Grace Preyer Rush, and it is hoped that contacts may soon be made with the medical school, Cleveland College, and other organizations in the city.

DR. CHARLES W. RICHMOND, associate curator, division of birds, U. S. National Museum, has presented the museum with thirty-eight bird skins from South America and one from Africa. Twenty-six species and one genus new to the division are represented in the accession.

THE New York Botanical Garden has received more than 280 new botanical species and seven new genera as a gift from Dr. Henry H. Rusby, dean of the Columbia College of Pharmacy. Dr. Rusby obtained this collection during the Mulford biological exploration of the Amazon Valley in 1922, when he, with Dr. Orland E. White, of the Brooklyn Botanic Garden, and Martin Cardenae, a botanical student sent by the Bolivian Department of Education, explored the foothills at the eastern base of the Andes.

ANNOUNCEMENT was made by Chancellor Charles W. Flint, of Syracuse University, of the gift of a demonstration forest by the Charles Lathrop Pack Forestry Trust founded by Charles Lathrop Pack, of Lakewood, New Jersey, president of the American Tree Association. The gift is in trust to the univer-

sity for the use and purposes of the New York State College of Forestry at Syracuse University, and will be the largest demonstration forest in the United States. It is situated on the main automobile route between New York and Montreal and is north of Glens Falls in the Lake George section of the Adirondacks. The gift is made outright to the university and the area is to be given over to scientific forestry management including reforestation through all its various phases from seed to mature timber, with particular attention to the evergreens and softwoods.

UNIVERSITY AND EDUCATIONAL NOTES

PRINCETON UNIVERSITY has received from an anonymous donor the sum of $200,000 to establish a chair to be known as the Henry Fairfield Osborn research professorship of biology in honor of Dr. Henry Fairfield Osborn, a graduate of Princeton in 1877 and president of the American Museum of Natural History.

A GIFT of $500,000 to the endowment fund of the Washington University Medical School coming jointly from Robert S. Brookings, president of the university corporation, and the General Education Board, was announced at the commencement. President Brookings stated that gifts received by the university since last July 1 totalled $3,352,001.

THE will of the late Dr. Milton B. Hartzell, recently admitted to probate, showed a bequest of $100,000 to the University of Pennsylvania to establish the Milton Bixler Hartzell professorship of therapeutics. Dr. Hartzell, formerly professor of dermatology at the university, died in April.

DR. R. W. THATCHER, for the past six years director of the New York State Agricultural Experiment Station at Geneva, has resigned to accept the presidency of the Massachusetts Agricultural College. Dr. Thatcher will enter upon his new work on September 1.

DR. ARTHUR STANLEY PEASE, professor of Latin at Amherst College, has been elected president of the college to succeed Dr. George Daniel Olds.

DR. FLOYD HECK MARVIN, formerly president of the University of Arizona, has been elected president of the George Washington University to succeed Dr. William Mather Lewis, who has accepted the presidency of Lafayette College. He takes office on September 1.

DR. LOUIS WILLIAMS MCKEEHAN, research physicist for the Bell Telephone Laboratories in New York City, has been appointed professor of physics and director of the Sloane Laboratory of Yale University.

DR. RUDOLPH J. ANDERSON, who has been connected with the New York State Agricultural Experiment Station, Geneva, N. Y., has been appointed professor in chemistry in Yale University, to cooperate in research in organic chemistry and biochemistry. Dr. Anderson has been cooperating with Professor Treat B. Johnson during the past year in the research on tuberculosis, which is supported by funds appropriated by the National Tuberculosis Association.

DR. S. C. BROOKS, professor of physiology at Rutgers University, has been appointed professor of zoology at the University of California. Professor Brooks will work in the field of experimental cellular biology and biophysics.

DR. ARTHUR I. KENDALL, professor of bacteriology and public health at Washington University School of Medicine, St. Louis, has been appointed professor of bacteriology at Northwestern University Medical School, where he was formerly dean. William T. Bovie, Ph.D., of the Harvard Medical School, has been appointed professor of biophysics, Dr. Goodwin L. Foster, Ph.D., University of California Medical School, assistant professor of biochemistry, and Dr. Stephen W. Ranson, of the University School of Medicine, professor of neuroanatomy.

DISCUSSION AND CORRESPONDENCE

ELEMENT NO. 61

MY attention has been called to the statement of Professor Rolla in *Nature* for April 30, in which he claims priority for the name Florentium for element No. 61. He says, "We believe that the priority in the discovery of element No. 61 belongs instead to those who first had sure data as to its existence."

On this basis the name Illinium deserves priority. The fact that Professor Rolla deposited a *plico suggellato* instead of publishing his paper, demonstrates that he was not, at that time, sure of his discovery. When Harris, Hopkins and Yntema published their paper and gave to element No. 61 the name Illinium, they were *sure* of their results on the basis of four, independent lines of evidence: 1. The 135 spectral lines referred to in *Nature* (Feb. 26). 2. The concentration of Illinium in rare earth fractions between neodymium and samarium. 3. An absorption spectral band characteristic of Illinium. 4. The X-ray spectra.

W. A. NOYES

URBANA, ILL.

THE STORY OF THE BEAR IN THE FIRST PRINTING OF DARWIN'S "ORIGIN OF SPECIES"

IN a previous letter to SCIENCE, it was mentioned that Hearne's story of the black bear is a distinctive feature of the first edition of Darwin's "Origin of Species" which was omitted in the second printing of this famous work. Professor E. B. Poulton, the greatest living authority on the works of Darwin, writes as follows on March 27, 1927:

> I'm not sure that Hearne's story of the Black Bear is fabulous. Anyway this is the reference: "Journey from Prince of Wales's Fort in Hudson Bay to the Northern Ocean: 1769 to 1772." Samuel Hearne; Edited by J. B. Tyrrell, Toronto; Champlain Society: 1911: pp. 344–345. The original edition was published in 1795 and the reference in it is pp. 370–371, at least Major Leonard Darwin believes it is so. I expect the Bodleian has a copy, and, if so, I will look it up and write to you again.

HENRY FAIRFIELD OSBORN

A NEW FIND OF THE WOOLLY ELEPHANT IN MICHIGAN

OF the numerous elephantine remains found in this state more than three fourths have been of the mastodon variety rather than that of the true elephant, or mammoth type.

So far as known there have been but eight finds of elephant within the state, only four of which have been specifically identified.

Elephas columbi, northern part Jackson Co.
Elephas (*primigenius*) *boreus*, near Three Oaks, Berrien Co.
Elephas (*primigenius*) *boreus*, near Eaton Rapids, Eaton Co.
Elephas boreus, near Gladwin, Gladwin Co.

The find here given is a tooth fragment, rounded so as to resemble a cobblestone found in the fall of 1925 in a gravel pit in the southwestern part of Oakland County, about one and a half miles north of New Hudson. The gravel deposit is of the nature of a kame ridge associated with the Interlobate Moraine of the Late Wisconsin ice-sheet. Some 140 acres of this deposit are owned by the Standard Gravel Company, eight to ten acres of which have been opened and operated for the last eight and one half years. The superintendent is Mr. O. E. Gooding and Mr. Rex Gooding, the night foreman, who picked up the specimen and noticed something peculiar about its appearance. The gravel deposit here is about one hundred feet thick and the tooth came from a depth of about seventy feet but may have rolled into this position from above. It was associated with rounded pebbles, cobbles and an occasional boulder, the bulk of which is of Canadian origin. The specimen was carried home, broken open in the direction of the plates, and a fragment consisting of five plates given to a former pupil of the writer, Mrs. William A. Campbell, who in October, 1926, submitted it for identification.

The fragment was apparently broken from somewhere near the middle part of the tooth, the base being so rounded as to give no indication of roots. The height is 16 to 18 cm, greatest width 920 mm, distance across the four plates still in position about 45 mm, or the equivalent of about nine plates in 100 mm. These plates are flat, very regular and encased in a delicate enamel shell having a thickness of about 1½ mm. These plates come to the sides at right angles, suggesting that we have an upper tooth, while the number of plates indicated suggests one of the later molars. The specimen is greatly weathered, when compared with the ordinary mastodon teeth, the dentine and cement having the appearance of chalk or kaolin, except where discolored by iron stain. There can be little doubt but that the specimen tooth is that which has been generally identified with *Elephas primigenius* of the Old World and Alaska but now separated by Hay under the name of *E. boreus*. If this proves to be specifically distinct from the former the name *boreus* seems to the writer especially well chosen, since its occurrence in the lake region westward and its apparent relation to the till sheets and recessional moraines of the Iowan and two Wisconsin ice-sheets suggests strongly a much closer association with the actual ice than in the case of *E. columbi* and *E. imperator*.

W. H. SHERZER
MICHIGAN STATE NORMAL COLLEGE

THE CONTROL OF COTTON-WILT BY THE USE OF ORGANIC FERTILIZERS

IN a recent article concerning the means by which the cotton-wilt fungus, *Fusarium vasinfectum*, induces wilting (*Jour. Agr. Res.*, v. 33, p. 1143-1162, 1926), the writer called attention to the fact that in a medium containing inorganic nitrogen the fungus produces substances that are deleterious to cotton. On the other hand, when organic nitrogen was used in the medium, no toxic effects were obtained.

In view of these findings, attention is now directed to the possibility of controlling wilt by the use of organic fertilizer, either in the form of barnyard manure or of some green manure, preferably some nematode-resistant legume. As the parasite causing wilt is a soil inhabitant, there is considerable possibility that its metabolic products in the soil may or may not exercise a deleterious effect on the roots, depending upon the chemicals present in the soil.

Cotton-wilt is much more restricted in its range and prevalence on different kinds of soil than certain other vascular diseases caused by species of Fusarium, as, for example, tomato wilt or stem rot of sweet potatoes. Barring the presence of nematodes, if a grower reports that he has considerable cotton-wilt, it can reasonably be predicted that his soil is rather poor or worn out, lacking particularly in organic matter. If nematodes are present, then the use of organic matter in such soil will not remove the possibility of wilt development, although it may partially alleviate the losses that might be incurred by stimulating the growth of the plant. Thus, as with wilt-resistant varieties, the presence of nematodes interferes with the ability of the plant to ward off infection.

To explain these phenomena, the following theory is at present held by the writer. *Fusarium vasinfectum* is a wound parasite and invades only after some injury has occurred to the roots. This injury may be caused by various agents, including diverse microorganisms, nematodes or other soil-inhabiting metazoa, or by chemicals. Having once gained entrance into the vascular system of the root, it lives a semi-parasitic existence within the water-conducting tubes, confining itself for a large part to the non-living material within the dead vessels. Only after the living tissues are killed or greatly weakened in advance of mycelial invasion will the fungus grow and fructify in those parts. This theory is in part borne out by the fact that no amount of inoculum applied to the top of a plant will induce infection on living parts.

Because of the importance of cotton-wilt, attention is directed in this preliminary note to the possibility of its control by the use of organic fertilizers. Orton's findings (U. S. Dept. Agr. Farmers' Bul. 333, 1910), which have doubtless acted as a deterrent in the use of organic fertilizers for the control of wilt, are based on very little experimental data, and his results are contradicted by the work of Fulton (La. Agr. Exp. Sta. Bul. 96, 1907). The writer has some data which seem to confirm Fulton's work.

H. R. ROSEN

AGRICULTURAL EXPERIMENT STATION,
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EDITORIAL ETHICS IN SCIENTIFIC PUBLICATIONS

SOME weeks ago I was honored by an invitation to give a short address on "The Rôle of Wave Length in Modern Theories of Radiation," this being part of a program in connection with a joint meeting at Schenectady of the Union and Rensselaer Chapters of Sigma Xi. The address was broadcasted by WGY. For publicity purposes, an advance copy of the address was furnished to the Associated Press.

In the issue of *Telegraph and Telephone Age* for May 16, 1927, on page 225, there appears what purports to be an article contributed by me to that periodical under the title, "The Rôle of Wave Length in Modern Theories on Phenomena of Radiation." This article contains certain parts of my address, but, in addition to the change of title, certain unfortunate omissions were made.

This material was published over my name, but without my permission having been first obtained; without advising me in advance that the article was to be thus published, and, what is of far more significance, *no acknowledgment whatsoever was given of the occasion for which the material was prepared.* The casual reader will assume, of course, that the article was prepared specially for *Telegraph and Telephone Age.*

In view of the fact that I have experienced previously several other incidents of this kind and know that others have had similar experiences, I am recording these facts in the nature of a protest against such a practice as this, which is becoming all too common. It seems to me that the ethics of the editorial profession should be based upon the ordinary courtesies which ought to be extended to an author or speaker.

F. K. RICHTMYER

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MICRO BLOOD SUGAR METHOD AND THE BLOOD SUGARS OF INSECTS

CHEMICAL analyses of the constituents of the blood of insects have been largely neglected because of the lack of suitable quantitative micro-methods. Biological fluids, especially of insects, are always present in minute quantities, and analyses of these fluids must necessarily be made by micro methods. This is especially true if the insect, after the extraction of the blood, is to continue living. Recent work on insect blood seems to have been largely qualitative in character.[1,2] Bishop,[3] however, gives quantitative data for the blood of honey-bee larvae, using blood collected from fifty animals. Considering the variations among individuals, such results can hardly be compared.

[1] Muttkowski, R. A., 1923, Bull. Brooklyn Ent. Soc. Vol. 18, p. 127; 1924, Bull. Brooklyn Ent. Soc. Vol. 19, p. 4.

[2] Haber, V. R., 1926, Bull. Brooklyn Ent. Soc. Vol. 21, p. 62.

[3] Bishop, G. H., 1925, *Jour. Biol. Chem.*, Vol. 66, p. 77.

In attempting to determine the blood-sugars of single insects, the writer was faced by the necessity of procuring a method requiring less than 0.5 cc of blood for a single determination. Various modifications of existing macro-methods, which use 0.1 cc of blood, have been described.[4,5,6] However, 0.1 cc of blood is more than can be safely, if at all, extracted from a single insect, and an attempt was made to reduce one of the most popular blood-sugar methods, Folin and Wu,[7,8] so that only 0.03 cc of blood is necessary for a single determination. The method is a reduction rather than a modification of the original one, and the original technique is retained throughout. The changes made have to do with the quantities of solutions used rather than with the nature of the reagents or the method of procedure.

Capillary pipettes with rubber bulbs attached are drawn out to deliver thirty drops per cc. The capillary portion should be long enough to hold at least one drop of liquid, and the length which will exactly hold one drop should be etched at that point. The reagents are then added in drops instead of cubic centimeters as is done in the macro method.

The reagents used in this method have been fully described by Folin and Wu and improved upon by Folin and Svedberg[9] and the reader is referred to those papers for their preparation. The method, as has been stated, is also the same, except that volumes in the macro method are to be interpreted as drops in this method. The final volumes for colorimetric comparison are diluted to 2.5 cc.

The following readings were obtained when known concentrations of glucose were used as unknowns:

TABLE I

Original mg/100 cc	Obtained	Per cent. difference
350	365.4	5.0
300	308.4	2.8
275	265.8	3.4
225	228.3	1.4
190	185.0	2.6
175	173.0	1.1
175	180.1	2.9
150	148.0	1.3
150	156.1	4.0
150	149.5	0.4
130	124.9	3.9
125	122.0	2.4
125	124.4	0.4
100	98.1	1.9
95	93.5	1.2
85	82.0	3.5
70	66.3	5.0
70	70.5	0.7
55	56.2	2.1
50	48.3	3.4
50	46.3	7.4
40	39.1	2.5
25	23.7	5.2

As a preliminary check on the practical applicability of this method, a number of grasshoppers were tested for blood-sugars. In every case, but one insect was used for each determination, and after withdrawing 0.03 cc of blood, the insect remained alive and apparently normal. As stated above, this is only a preliminary work on the blood sugars of Orthoptera. No attempt was made to keep conditions, dietary or environmental, under control. Below are given values for blood-sugars obtained from several species of grasshoppers and Japanese beetle larvae.

TABLE II

Grasshoppers	Blood-sugar mg/100 cc	Average	Range
Romelea microptera (nymph)	42.4 40.4 36.0 48.0 34.2 49.4	41.7	34.2 – 49.4
Melanoplus femur rubrum	35.2 33.3 30.6 } same individual 31.6 } 41.8 } same individual 41.9 }	35.3	30.6 – 41.9
Melanoplus differentialis	36.1 31.4 31.0 36.1 38.7 45.9	36.5	31.0 – 45.9
Chortophaga virdifasciata	35.2 32.8	34.0	
Encoptolophus sordidus	36.4	36.4	
Japanese beetle			
Popellia japonica (larvae, 3rd instar)	68.8 56.3 63.0 69.2 57.7	63.0	56.3 – 69.2

[4] Byrd, T. L., 1925, *Jour. Lab. and Clin. Med.*, Vol. 11, No. 1.

[5] Foster, G. L., 1923, *Jour. Biol. Chem.*, Vol. 55, p. 291.

[6] Höst, H. F., and Hätlehol, R., 1920, *Jour. Biol. Chem.*, Vol. 42, p. 347.

[7] Folin, O., and Wu, H., 1920, *Jour. Biol. Chem.*, Vol. 41, p. 367.

[8] Folin, O., 1926, *Jour. Biol. Chem.*, Vol. 67, p. 357.

[9] Folin, O., and Svedberg, A., 1926, *Jour. Biol. Chem.*, Vol. 70, p. 405.

The data, although limited, suggest that taxonomically related species may have blood-sugars quantitatively similar. This point is to be further investigated.

The writer is indebted to Dr. J. H. Bodine for valuable advice given toward the completion of this paper.

REUBEN BLUMENTHAL

SPECIAL ARTICLES

THE STUDY OF AN ULTRAVIOLET TRANSMITTING MATERIAL

THE beneficial effects of sunlight have long been known, but the discovery that the ultraviolet portion of the sun's radiation is of value in the prevention of rickets in the human being, leg-weakness in chickens and leg-stiffness in swine, is of recent date. Furthermore, data are being accumulated from different sources which point to the conclusion that the portion of the ultraviolet spectrum which is concerned with normal bone formation lies between 2,800 Å and 3,200 Å.

For the measurement by chemical means of the relative amount of ultraviolet light which passes through a given material, the acetone-methylene blue method described by Webster, Hill, and Eidinow[1] was selected. The acetone-methylene blue reagent is decolorized by radiations shorter than 3,200 Å. Although this reaction has not been studied critically, and the exact limits of the spectrum between which it is sensitive are not known, it is significant that the maximum chemical susceptibility[2] of acetone is between 3,000 Å and 2,470 Å, and that this section of the spectrum lies in the physiologically active range. When the reagent is placed at a distance of three feet from a quartz mercury lamp, the change in color caused by the light filtered by ordinary window glass is less than 5 per cent. of that noted when no filter is used. Measurements made by Coblentz and Fulton[3] show that window glass permits the passage of little or none of the radiations of wave length less than 3,200 Å. Hence the acetone-methylene blue reagent is apparently sensitive only to wave lengths shorter than about 3,200 Å.

Fundamental and practical studies of the ultraviolet transmitting properties of a glass substitute, Cel-O-Glass, are under way. According to the acetone-methylene blue reaction, 47 per cent. of the light from a quartz mercury lamp, of wave length less than 3,200 Å, is transmitted when the reagent is at a distance of three feet from the lamp. Daily readings by the colorimetric method, of the total ultraviolet portion of sunlight, less than 3,200 Å, made over a period of five months, show that 50 per cent. of this radiation passes through the material.

In view of the use to which the ultraviolet transmitting material would be put, it was desirable to determine whether or not the percentage transmission, as measured by physical and chemical means, could be confirmed physiologically. A series of experiments is under way, using the chicken as the experimental subject, to determine the percentage of light, effective in the normal formation of bone, which is passed by Cel-O-Glass. The basal ration[4] used is 99 per cent. yellow corn, 1 per cent. sodium chloride and skimmed milk *ad libitum*. The birds in one set of pens receive a daily dosage of light from a quartz mercury lamp (Uviarc Poultry Treater Lamp), while those of another set are exposed to the light which has been filtered by the glass substitute.

The ash, and in some cases the calcium and phosphorus, of the dry, alcohol-ether extracted femurs and wing bones, are determined in four to eight birds selected from each pen, each week, for an eight- or ten-week period, and these values are used as a measure of the effectiveness of the rays in bone formation. Preliminary results indicate that the percentage of the effective rays which pass through Cel-O-Glass is between 33 per cent. and 40 per cent. A detailed report will be made in the near future of experiments with about 900 birds.

Further experiments are to be conducted which seek to express hours of ultraviolet light of sunlight in terms of hours of this radiation from a quartz mercury lamp. The comparison will be made by the physiological method mentioned above, and the results will also be expressed in methylene blue units.

A critical study of the acetone-methylene blue method and of its modification for use in a colorimeter is being made in the department of chemistry of Rutgers University.

WALTER C. RUSSELL
O. N. MASSENGALE[5]

DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY,
NEW JERSEY STATE AGRICULTURAL
EXPERIMENT STATION,
NEW BRUNSWICK, N. J.

[1] Webster, Hill and Eidinow, *The Lancet*, April 12, 1924, p. 745.

[2] Henri and Wurmser, *Comp. rend. 156*, 230 (1915).

[3] Coblentz and Fulton, Bur. Stds. *Sci. Paper No. 495*, Fig. 4 (1924).

[4] Wisconsin Agric. Expt. Sta. Bull. *371*, 21 (1925); Hart, Steenbock and Lepkovsky, *J. Biol. Chem. 65*, 572 (1925).

[5] Cel-O-Glass Industrial Fellow. This investigation is being conducted on a fellowship grant from Acetol Products, Inc., New York.

THE PRESENCE OF HEMOLYTIC, CYTOLYTIC AND COMPLEMENT-BINDING SUBSTANCES IN EXTRACTS OF ENDAMOEBA HISTOLYTICA

DURING some researches connected with evolving, if possible, a complement-fixation test which might be useful in the diagnosis of infections with *Endamoeba histolytica,* it was noted that alcoholic extracts of cultures of this organism were hemolytic and cytolytic, and capable of binding complement when mixed with the serum of individuals harboring this parasite. Experiments with such extracts have shown that the hemolytic properties of the extracts were destroyed by heating the extracts to 80° C. in a water bath for one hour; that the hemolytic substance was soluble in absolute and 50 per cent. alcohol, but practically insoluble in normal salt solution; that the hemolytic substance is apparently contained in the bodies of the amoebae as it was not present in the supernatant fluid of the cultures; and that this substance was apparently only present in the living organisms, as old cultures containing no living organisms did not possess hemolytic properties. It was also determined that the hemolytic substance was not specific for human red blood corpuscles, but was equally hemolytic to rabbit and guinea-pig red blood corpuscles.

The extracts of cultures of *Endamoeba histolytica* did not contain any bacteriolytic substance, a fact in agreement with the well known observation that this organism does not ingest bacteria under normal conditions.

It has been determined that the complement-binding substance is only active when brought in contact with the blood serum of individuals harboring *Endamoeba histolytica.* Using the usual method of making the complement-fixation test for syphilis adopted in the United States Army, but employing the extracts of *Endamoeba histolytica* as antigens, positive results have been obtained with such sera, and negative results with the blood sera of individuals free from infection with this parasite or infested with other endamoebae, as *Endamoeba coli, Endamoeba nana,* etc. These observations are still incomplete, and will be published in full later, but it is believed that a useful diagnostic complement-fixation test for infections with *Endamoeba histolytica* can be evolved by using alcoholic extracts of the parasite as antigens.

The results of the complement-fixation tests demonstrate that antibodies are present in the blood serum of individuals infected with *Endamoeba histolytica,* not only in cases presenting symptoms of the infection, but also in the "carriers" of this parasite who are apparently without any symptoms or physical signs of the infection.

A detailed description of the experiments demonstrating the facts referred to above will be published in the July issue of *The American Journal of Tropical Medicine.*

CHARLES F. CRAIG

ARMY MEDICAL SCHOOL,
WASHINGTON, D. C.

THE HAWAIIAN ACADEMY OF SCIENCE

THE Hawaiian Academy of Science held its second annual meeting from May 4 to 7. The enclosed program gives a list of the papers presented. The subject of Dr. A. L. Dean's presidential address was a plea for the general teaching of a more broadening and interesting kind of philosophy, which would help the student to see his own little line of endeavor in relation to the whole domain of human interest. It was an answer to the controversy between Professors Davis and Durant.

Three special meetings of the academy were held during the year to hear distinguished visiting scientists. On July 26, 1926, Dr. L. R. Jones, professor of plant pathology at the University of Wisconsin, spoke on "Disease Resistance in Plants"; and Dr. Alexander A. Maximow, professor of anatomy, University of Chicago, gave two addresses on "Tissue Culture," on August 18 and 25, 1926.

Forty-five new names have been added to the membership rolls, making the total number 159. The academy has had a very successful year in both finances and enthusiasm.

The proceedings of the first annual meeting were published by the Bernice P. Bishop Museum, as special publication 11. No provision has so far been made for publishing the proceedings of this year's meeting.

The officers elected for the coming year are: *President,* Guy R. Stewart, chemist, Hawaiian Sugar Planters' Experiment Station; *vice-president,* J. F. G. Stokes, ethnologist, Bernice P. Bishop Museum; *secretary-treasurer,* Professor Paul Kirkpatrick, University of Hawaii; and *councilor,* Dr. Nils P. Larsen, medical director, Queens Hospital. These men with Charles S. Judd, *councilor,* and Dr. A. L. Dean, *retiring president,* will compose the council.

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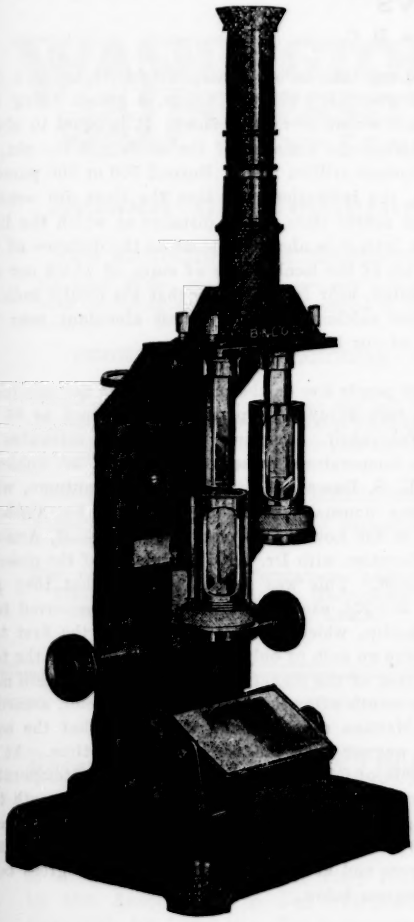

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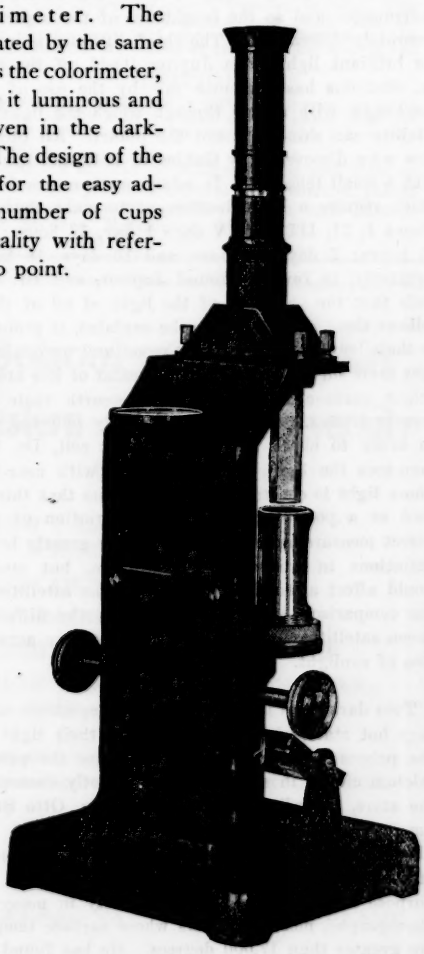

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SOME PAPERS PRESENTED AT THE PHILADELPHIA MEETING

THE four bright moons of Jupiter, like the moon of the earth, rotate once on their axes in the same time that it takes them to revolve around their parent planet, and so they keep the same face towards Jupiter at all times, Dr. Joel Stebbins, professor of astronomy at the University of Wisconsin, told the American Astronomical Society. He made this discovery while working last summer at the Lick Observatory in California. Dr. Stebbins made use of the 12-inch refracting telescope of the observatory and a photo-electric photometer, by means of which the light from a star, planet or moon is focused on a film of metallic potassium. This results in a minute electric current which can be measured with a delicate electrometer and so the brightness of the object can be accurately determined. The chief difficulty is in keeping the brilliant light from Jupiter itself off the cell, but Dr. Stebbins has overcome this by the use of a small diaphragm with a hole through which the light from a satellite can shine, but not the planet. All these satellites were discovered by Galileo in 1610 and can be seen with a small telescope. In addition, there are five others which require a large instrument to make them visible. Moons I, II, III and IV take 1 day, 18 hours; 3 days, 13 hours; 7 days, 4 hours, and 16 days, 18 hours, respectively, to revolve around Jupiter, and Dr. Stebbins finds that the variation of the light of all of them also follows these periods. This, he explains, is probably due to their being bodies like our moon and unequally bright over their surface, so that as a greater or less area of the bright surface is exposed to the earth their light is greater or less, because this is largely reflected sunlight. In order to check the photo-electric cell, Dr. Stebbins compares the light of the satellites with near-by stars whose light is constant and he suggests that this may be used as a possible check on the variation of sunlight. Direct measurements of sunlight vary greatly because of variations in atmospheric conditions, but since these would affect alike the brilliance of the satellites and of the comparison stars, a variation in the difference between satellites and stars would indicate an actual variation of sunlight.

TWO dark lines in the rainbow-like spectrum of certain very hot stars, obtained by passing their light through the prisms of a spectroscope, indicate the presence of calcium clouds in space and not directly connected with the stars, according to a paper by Dr. Otto Struve, of the Yerkes Observatory. He has attempted to learn whether these so-called "detached" calcium lines reveal any of the properties of the calcium clouds. For this purpose he has studied their intensity in many spectral photographs, mostly of stars whose surface temperatures are greater than 17,000 degrees. He has found that the lines are much more pronounced in stars farther away from the sun than in our nearby neighbors, up to a distance of about 700 or 800 parsecs, a parsec being the astronomer's unit of measurement. It is equal to about 206,000 times the distance of the earth and the sun, or about nineteen trillion miles. Beyond 700 or 800 parsecs, however, the indications are that the lines are weaker, as in the nearer stars. This distance at which the lines are most intense is about the same as the distance of the boundaries of the local cluster of stars, of which our sun is a member, near its center, so that his results indicate that these calcium clouds are most abundant near the borders of our local star cluster.

IF any people live on the planet Mars in the equatorial regions, they enjoy a temperature of as much as 86 degrees Fahrenheit, according to tentative estimates of Martian temperatures presented by Dr. W. W. Coblentz, of the U. S. Bureau of Standards. Last autumn, when Mars was unusually close to the earth, Dr. Coblentz worked at the Lowell Observatory at Flagstaff, Arizona, in collaboration with Dr. C. O. Lampland, of the observatory's staff. This was similar to work that they performed in 1924, except that they used an improved form of apparatus, which made it possible for the first time to measure an area of only one one hundredth of the total visible area of the planet. The measurements were made about a month after the beginning of summer, according to the Martian calendar, and they show that the south pole is warmer than the north at such a time. At the south pole of Mars, says Dr. Coblentz, the temperature was from 5 to 14 degrees Fahrenheit. In the south temperate zone it was from 68 to 77 degrees, in the torrid zone 68 to 86 degrees, the north temperate zone, 32 to 68 degrees and at the north pole from 12 degrees below to 40 degrees below.

ELECTRIC arcs, using a current of a thousand to two thousand amperes, more than ten times as much as the arcs in the projectors of large movie theaters, have been used to obtain the spectra of atoms from which one or more of their electrons have been lost, according to Dr. Arthur S. King, who presented his paper at the meeting of the American Physical Society. Dr. King is in charge of the physical laboratory of the Mt. Wilson Observatory in Pasadena, Calif., where he performed his experiments. By means of these arcs, obtained by passing the high current between small metallic rods in a vacuum, extremely high temperatures are obtained so that the electrons in the atoms are made to jump from one path to another. Such electron jumps, according to modern physical ideas, occur whenever energy, whether light or heat, is given off from a substance; but in the high-power arc, jumps occur that are ordinarily rare because so much energy is obtained to displace the electron. Sometimes, in the arc, the electrons leave the atom completely and the spectrum, obtained when the light is passed through

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the prisms of a spectroscope, reveals these changes. Previously it was not possible to obtain these characteristic spectrum lines in great intensity, but now they are obtained on a large scale. These experiments may help astronomers to understand better peculiar effects in star spectra.

A METHOD for cutting off three-inch pieces from a beam of light, though the light moves at 186,000 miles a second, was described by Dr. Ernest O. Lawrence and Dr. J. W. Beams, of Yale University. Though light travels so fast that it can encircle the earth seven times in a second, Dr. Lawrence and Dr. Beams made use of a shutter that turned the light on and off with such rapidity that each "piece" of light was only about three inches in length. Each flash lasted a hundred billionth of a second. The investigation was undertaken in an endeavor to measure the length of what are called "quanta" of light, for according to modern ideas, light is transmitted as separate pulses, each of which is called a quantum. Physicists have been uncertain as to how long these quanta are, but by some it was believed that they were as much as a yard in length. These extremely short flashes of light were measured by a very delicate photoelectric cell, which gives off an electric current when illuminated, and they found that so long as the total amount of light reaching the cell was the same, the resulting current was not affected by the length of the individual flashes. One three inches long produced as much effect as a piece of light many miles or more in length, and this shows, say the investigators, that the individual quanta are less than three inches in length.

STUNTED thyroid glands, held responsible for so many things including idiocy in children and dwarfishness in animals, have a further effect. Experiments with mice show that the younger generation suffers from thyroid deficiencies in the mothers. Dr. Charles B. Davenport, of the genetics department of the Carnegie Institution of Washington, told the American Society of Zoologists that injury to this gland in a mother mouse will stunt the growth of her babies or of babies of normal mice suckled by her. Such an injury evidently modified the mother's milk and also her other secretions necessary to produce normal offspring. Dr. Davenport was assisted in his work by Professor W. W. Swingle, of the zoology department of the University of Iowa. Another addition to thyroid knowledge was made by Dr. F. E. Chidester, of the zoology department of West Virginia University, and W. M. Insko, Jr., assistant in animal husbandry. In experiments with chickens, rats and rabbits they found that light doses of thyroid bring about marked elongation of the bones and increased weight. It was proved some time ago that heavy doses of thyroid cause loss of weight with an accompanying nervousness.

How much does the lack of a thyroid gland slow up growth? Working with 700 thyroidless white rats, Dr. Frederick S. Hammett, of the Wistar Institute, has attempted to show some of the things that happen to the animals' physiology when the much-discussed gland is removed. At a symposium on growth in health and disease held by the American Association for the Advancement of Science, Dr. Hammett said that the results from his experiments showed considerable variation. Slowing up of growth when the thyroid is removed is not a simple proportionate affair, he continued. Modification is produced which results in shifts in bodily proportions. As these variations occur in the different organs their functions are proportionately intensified with consequent influence on the process of development. "The thyroid is the most variable organ in the body," declared Dr. Hammett, "responding by changes in size and functional activity to changes in both external and internal environment. It is therefore not going far from the path of scientific rectitude to suggest that long-continued modifications of thyroid activity in environment or habit, voluntary or enforced, may be a cause of species differentiation within a genus, or at least of variety production within a species. If the inheritance of acquired characteristics is possible, there is here available a mechanism by which this possibility could be realized. For it would be absurd to deny the possibility that such profound alteration of differential development as is shown in these animals, with the consequent alteration of relative functional intensity, should have no modifying influence on the germ plasm."

THE evolution of modern plants and of modern climates began together at the North Pole some six or seven million years ago, when the last of the dinosaurs were still lumbering about the earth. It continued with increasing speed through the Tertiary age which followed, until the comparatively recent time of the glaciers. It was during this time, according to the record of the rocks, that the plants of the earth began to show evidences of being divided into growth zones influenced by climate; until then, all the earlier plants were of types such as now grow in the tropics and they were distributed evenly over the whole earth, indicating the prevalence of a uniformly warm climate. At the meeting of the Americal Botanical Society, Dr. Arthur Hollick, of the New York Botanical Garden, outlined the evidence for his theory that the first temperate zone plant life evolved in the polar regions. The higher forms of flowering plants, he said, are primarily adaptations to a climate of alternating warm and cold seasons and their final invasion of the still uniformly warm tropics has been recent and is a matter of competition with the plants they found there rather than a response to a climatic urge. And it is in the tropics to-day that the only relics of the vegetation of an earlier world, the cycads and similar plants, remain to contest with the late-coming modern plants for a foothold. Plant fossils of Tertiary age from the tropics are very little different from the living plants of the same regions, whereas Tertiary fossils from the regions of the earth where winter comes show evidences of radical and rapid evolution.

THE world wanderings of the cactus were described before the American Botanical Society by Dr. J. N. Rose, associate curator of the U. S. National Herbarium at

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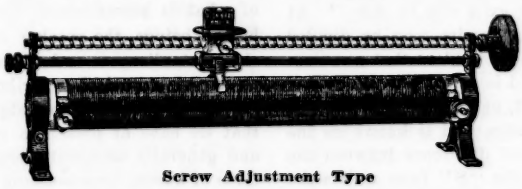

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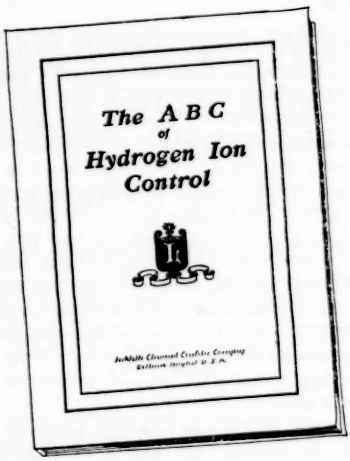
Washington. Although exclusively American in origin, the cactus is a great traveler and has found its way into all the dry corners of the earth. It was unknown in Europe before the voyages of Columbus, but soon thereafter was transplanted into Spain from Mexico and thence spread rapidly all around the Mediterranean. It has now become very common in Palestine; and its red, fig-shaped fruits recently provoked from a traveler the remark that "in spite of the parable, it is now possible to gather figs from thistles in the Holy Land." Recent religious art has shown St. John the Divine standing by a cactus bush, and in another picture cacti were shown in the setting of the story of Ruth; but these are only rather comic anachronisms. Until recently practically all the studies that had been made on this very typically American plant were by Europeans, Dr. Rose informed his fellow-botanists, but the cooperation of the Carnegie Institution of Washington, the U. S. National Museum and the New York Botanical Garden has made possible a number of scientific expeditions to all parts of both Americas in a thorough-going survey of the field and a collection of specimens representing over a thousand kinds of cacti. In collaboration with Dr. N. L. Britton, of the New York Botanical Gardens, Dr. Rose has written a monumental work summing up everything now known about these prickly plants.

NEW conceptions of how immunity is developed against germ-caused infections, that may have far-reaching effects on the protection of the human race against disease, were reported to the American Society of Bacteriologists by Dr. Philip Hadley, of the University of Michigan. According to the older views it was thought that all the bacteria of a particular specific kind must necessarily be alike in all their characteristics. Recent work, however, has shown, said Dr. Hadley, that "in one and the same bacterial culture organisms of vastly different potentialities for disease production may exist side by side." At present, many disease-producing species may be divided into two distinct types; one that is virulent that possesses certain individual properties and is called the "S type," and another that is non-virulent, or at least less virulent, that possesses other characteristics, and is known as the "R type." The most important difference between the two types lies in the fact that the "S" form resists the onslaughts of the defensive cells of the blood known as the phagocytes while the other form is readily destroyed by them. Change from one form to the other may be produced artificially in test tubes in the laboratory, Dr. Hadley stated. The most potent factor in inciting such changes has been found to be blood or serum from an animal which has been inoculated with the culture of the organism in question. In the presence of such serum the virulent form "S" passes over into the non-virulent form "R." The importance of being able to bring about such an action in the bodies of animals and human beings suffering from bacterial infection is at once apparent.

REPORTS, both plausible and impossible, as to the earliest prehistoric settlers in America were discussed by Dr. Aleš Hrdlička, of the U. S. National Museum. "A number of reports in the last two years deal with the probability of other men than the Indian and Eskimo having reached the Americas in pre-Columbian times," said Dr. Hrdlička. "People mentioned in this connection are the Chinese, Japanese, Melanesians, Polynesians and even Australians. There is much probability that some such contacts have actually been realized and that they may have resulted in the introduction of certain practices, implements and even some words. But a satisfactory evidence of this has not yet been produced. Reports of skulls resembling those of other races may be particularly misleading." Among the interesting, but untrue, reports of man having lived in this country in glacial or pre-glacial times, as man is known to have lived on the other side of the globe, Dr. Hrdlička mentioned the case of fossil teeth found in a slab of rock of the Eocene age. These ancient specimens resembled a man's teeth closely enough, so that a prominent dental journal speculated as to their human character. But when a paleontologist cleaned them, the teeth turned out to be from the mouth of a prehistoric horse. Dr. Hrdlička concluded that there is no proof at present that man existed in either North or South America as far back as the ice age.

ONE of the most baffling of psychological problems—how to find out what kind of a mental existence an animal has—was the subject of an address by Dr. Harvey Carr, president of the American Psychological Association. Dr. Carr, who is professor of psychology at the University of Chicago, discussed two methods of approaching the problem. The first, he showed, is to try to find out what goes on in the head of the animal and to envisage the world from the standpoint of the animal's experience. It is both logical and scientific to make inferences regarding an animal's consciousness on the basis of what is known about the emotions and reactions of human beings, the speaker declared. The fact that psychologists disagree and are uncertain about the conscious status of animals be attributed to the defects and uncertainties in their knowledge of man. "I do not think that we have at present a sufficient amount of accurate and generally accepted knowledge of the organic conditions of human consciousness to make any very convincing statements concerning many aspects of the psychic life of animals." The other angle from which animals can be studied is the objective method of the behaviorists, which ignores consciousness, in men as well as in animals. Dr. Carr classed himself as "somewhat of a behaviorist in the field of animal psychology," although he added that he does not class himself as a behaviorist so far as human beings are concerned. In closing, he suggested that inference about animal consciousness might best be made on the basis of the degree of the similarities between men and animals. The more similar to man an animal's reaction might be, the greater the chance that the animal felt similarly. But to work out these degrees of resemblance in exact statistics would be impossible now, he added.



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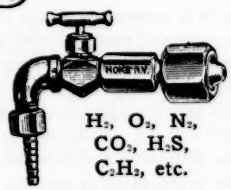

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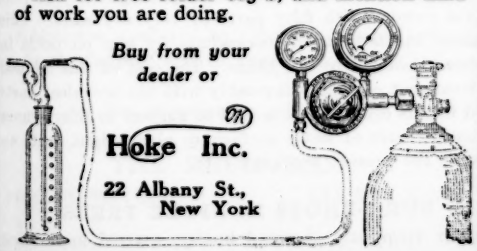

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EVOLUTION OF WHALES

How whales have changed from land animals to the denizens of the deep they now are is one of the problems of science which Remington Kellogg, associate biologist of the U. S. Bureau of Biological Survey, is unravelling by studying the fossil remains of the great sea beasts' hearing organs.

At the annual exhibit of the Carnegie Institution of Washington Mr. Kellogg displayed a complete collection of these fossilized "ears" from the time of the early Eocene down to the present.

The ancestors of the present-day whales heard with eardrums just as humans and other mammals do, but as the force of circumstances, that geologists do not yet understand, compelled them to take to the sea for a living their different organs underwent various modifications. The family of sea mammals that are known as whale-bone whales eventually lost their external ears and the external auditory tube became completely closed to preserve the eardrum from rupturing under the pressure that prevails at great depths in the sea. They have acquired in addition an elastic cartilage arrangement around the blow holes on the top of the head that closes tighter the farther they go down.

As a result the whale-bone whales now actually hear through their noses and the eardrum has become useless. They have developed in its place a bony structure coiled up like a conch shell known as the bulla. The ear bones are the hardest bones in the body of the whale and for this reason have survived in fossilized form where the other bones have disappeared entirely. In some prehistoric species, says Mr. Kellogg, it is the only bone there is available for study. For this reason science has an unusually complete record of the gradual stages by which the whale-bone whales acquired their present kind of organ of hearing.

The actual process by which these coiled conch shell bones receive sound waves is a problem that puzzles both physicists and biologists. The fact that whales are unusually shrewd in detecting danger that can only be conveyed by sound, is considered, however, as a demonstration of its efficiency as an organ of hearing.

MAN AN EARLY FOSSIL

Who was the first paleontologist, the first collector of those records of life in the rocks from which science has built up the history of the earth? Barnum Brown, of the American Museum of Natural History, New York, recently reported the discovery of a 5,000,000-year-old elephant's tooth found in Grecian ruins that were once frequented by Hippocrates, the father of medicine. He asked then: "Is this the earliest known fossil collected by man?"

Now Dr. George Grant MacCurdy, of Peabody Museum of Natural History, Yale University, points out that what is probably the first fossil to have been collected by man is a trilobite found by archeologists when digging out the floor deposits of a cave near Arcy-sur-Cure in the department of Yonne, France.

"This cave was first inhabited by Neanderthal man," Dr. MacCurdy explained, "then there came in turn the Aurignacians, Solutreans and Magdalenians generally referred to as the Cro-Magnon races. It was one of the Magdalenians who found the trilobite and left it in the cave some 20,000 years ago, at least 18,000 years before some Greek left the elephant tooth at the Asklepieion. The trilobite is incised ventrally and also bears two lateral perforations—proof that it had been the property of some Magdalenian occupant of the cave. This cave has been very appropriately christened *grotte du trilobite* (cave of the trilobite)."

Trilobites are crustaceans and first appeared in great variety in the geologic age known as Cambrian some 225,000,000 years ago; they lived through a number of geologic ages and finally became extinct during the Permian period some 75,000,000 years ago.

A NEW MOSQUITO POISON

E. Roubaud, of the Pasteur Institute in Paris, has recently announced that a formaldehyde compound manufactured in France offers advantages over anything previously used in the fight against mosquitoes.

M. Roubaud is a man of such high scientific standing that U. S. government entomologists are going to make tests, it is announced in the Bureau of Entomology. The new compound may prove to be a weapon in the hands of Americans who are handling the question of mosquito control over very large salt marsh areas. Even if this should prove impractical it appears that the new substance will be available for easy treatment of small ponds, fountains and the like.

The preparation is said to be non-poisonous to warm-blooded animals and fish and to have no injurious effect upon aquatic plants. It is in the form of an extremely light dust, readily driven by the wind. Settling upon the surface of the water, it brings about the almost immediate death of the larvae of the malarial mosquitoes, which are top feeders, and with a subsequent slight agitation of the water sinks slowly in suspension where it is eaten by the larvae of other mosquitoes.

Roubaud recommends a mixture by weight of one part of the powder with fifty parts of very dry sand. This mixture has been tried successfully by him on fields in Alsace inundated by the Rhine. The cost of this method of treatment compares favorably with the arsenical dusts used in this country. It is said to amount to fifty francs to ten hectares of water surface, or about eight cents an acre at the present exchange rate.

BURR-KNOTS IN APPLE TREES

That frequently observed knotty, scarred appearance of the twigs and branches of apple trees does not neces-

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Each class is limited to a maximum of 75 students, men and women being admitted on the same terms. Applications may be sent any time during the academic year but not later than June 15th.

If vacancies occur, students from other institutions desiring advanced standing may be admitted to the second or third year provided they fulfill our requirements and present exceptional qualifications.

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Medical and dental candidates must have completed three years of college work with special requirements in chemistry, physics and biology. The first class will not exceed 40, men and women being admitted on equal terms. Instruction will begin September 22, 1927.

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Charge for tuition will be $300 per annum, payable in equal installments at the beginning of each semester.

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sarily mean the trees are diseased. It may indicate an advantage over trees with clean smooth wood.

The appearance is often due to burr-knots which have been confused with aerial tumors of "hairy root" crown gall, but which are "root buds" or rudimentary stem-borne roots. Twigs bearing these knots when planted as cuttings readily take root and grow.

No American pomologist had advanced this theory until Charles F. Swingle, of the Bureau of Plant Industry, Washington, D. C., demonstrated it in a series of studies and experiments.

According to Mr. Swingle, it was known in England more than a hundred years ago that some varieties of apple trees with a certain class of knots propagated readily from cuttings, and he traces his interest in the subject to a conversation with R. G. Hatton, the English pomologist, who visited this country two years ago.

Mr. Swingle examined some five hundred varieties of apple trees in the Arlington orchard near Washington. Nearly half of this number showed the presence of the burr-knot. It was found to be a varietal characteristic. If they appeared on one tree of a given variety, they were found on all mature trees.

Cuttings were taken from many varieties bearing burr-knots and planted in moist sand. More than 80 per cent. rooted, in contrast to a average of about 1 in 1,000 in case of cuttings without burr-knots. Springdale, Wagner, Northern Spy, Early Harvest and Buckskin are among the varieties showing successful growth from cuttings containing such knots. Mr. Swingle is continuing his experiments along this line.

THE CONTROL OF SUGAR-CANE PEST

AIRPLANE dusting with sodium fluosilicate is meeting with considerable success in the control of the sugar cane moth borer which is threatening the cane-growing industry of the United States. This new method of control of the cane borer was described in a report by Dr. W. E. Hinds and Dr. Herbert Spencer, of the Louisiana experiment station, presented before the American Association for the Advancement of Science.

Results of a single application last year when the infestation was comparatively slight were most encouraging, the entomologists said. The average per cent. of infested joints in dusted areas, after the next generation had had time to develop, was only two fifths of that in the undusted areas, and the number of live borers per one hundred stalks was cut in half by the dust application. A higher degree of control may be possible in the future, they pointed out, with improved materials and a fuller knowledge of the conditions essential to the most effective work.

The treatment resulted in some burning of foliage but this was not severe enough, the entomologists stated, to be considered a serious matter. However, in some cases it was deemed advisable to mix 10 per cent. hydrated lime with sodium fluosilicate to reduce this danger.

The airplane dusting method was used because no ground machinery or hand guns can be used readily on a crop of full-grown sugar cane. The stalks overlap across the rows and it is impossible to get machinery through the fields.

"The practicability of applying insecticidal dust to a crop like sugar cane has been fully demonstrated at the Louisiana experimental station," the report concluded, "and the planters of Louisiana and of other countries as well may find in this method of treatment a valuable help in controlling various insect enemies of cane and other crops for which no method of treatment has been available heretofore."

GERANIUM-SCENTED BOILER ROOMS

DIPHENYL oxide, a white chemical with a powerful reek like geranium scent raised to the *n*th degree, is the newest effort of engineers to get double work out of every shovelful of coal that goes into the firebox. The trick consists simply of using the chemical in one boiler to run one engine, and then using the exhaust vapor from that engine, still very hot, to raise steam from ordinary water in a second boiler, according to Dr. H. H. Dow, manufacturing chemist of Midland, Mich. Dr. Dow has been experimenting with one of these bi-fluid boiler systems for some months, and states that it has proved itself quite successful and very economical of fuel.

The idea of getting double use from the original firing of fuel was tried first with mercury as the liquid in the first, or high-temperature boiler. From certain points of view this metallic liquid is almost ideal, but its great weight and considerable initial expense, together with constant losses, interposed engineering and economic difficulties. Furthermore, any leakage of mercury vapor is almost certain to be injurious to the workmen in the plant, because mercury is exceedingly poisonous. For these reasons, therefore, Dr. Dow sought for another liquid that would be light, cheap and non-poisonous, and still have high capacity for carrying heat over into the second boiler to generate steam for the second engine.

A number of organic chemical compounds were found to possess these qualities, but at the temperatures used in boilers they tended to break apart into other compounds useless for power purposes and to clog the boilers with carbonaceous materials of no use for carrying heat. Diphenyl oxide, however, has been used and recondensed and used over again many times at a pressure of 200 pounds per square inch and a temperature of 800 degrees Fahrenheit, with but little deterioration. It weighs but little more than water, as contrasted with mercury, which is heavier than lead. Its price is only 30 cents a pound in quantity lots, which according to Dr. Dow makes its cost, volume for volume, less than two per cent. that of mercury. The compound has been produced hitherto in comparatively limited quantities, because its only use has been in the perfume industry, but Dr. Dow states that there is no limit on the bulk that can be manufactured if it is desired for power plant uses.

THE SHALE OIL INDUSTRY

THE distillation of shale, which promises to become very important to the entire nation, is not a new way of getting oil at this time of approaching scarcity, but is merely an old method brushing its cobwebs off after over half a century of disuse in the United States. In France it is older yet, for there the production of oil from shale started in 1838, according to Dr. G. C. Riddell, consulting

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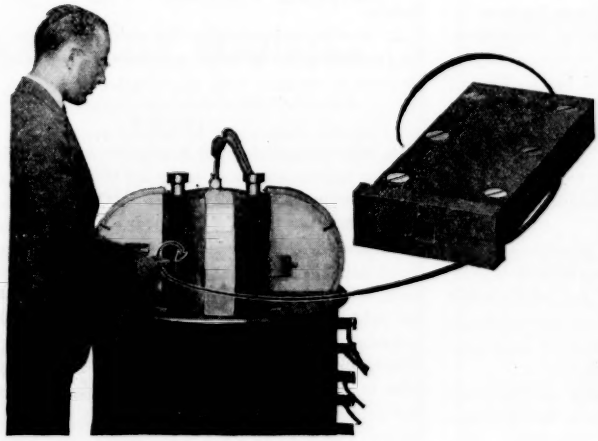

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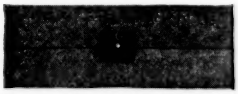

Used with a filter in determining preferred orientations of rolled metals, etc. Without a filter, is suitable for the Laue method.

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engineer of New York. In Scotland, oil was obtained from shale before 1850, but the best of the raw material is to-day exhausted. Shale pits 3,000 feet deep show how the industry once flourished.

In 1850 oil was distilled from shale in Utah and Pennsylvania and the development of a great shale industry would have resulted but for the discovery of well oil. The "liquid gold" fever following the development of oil in drilled wells in Pennsylvania caused the interest in shale oil to dwindle and then die, just as an impending scarcity has brought it to life again.

To date 186 patents have been granted in the United States for the production of oil from shale. Five of these were granted in 1858, fifteen in the next six years and none at all after that until 1891. From 1891 to 1914 ten patents were granted, from 1915 to 1919, thirty-four and from then to the present time one hundred and seven.

The competitive production of oil by distilling of bituminous rocks is no longer in doubt, Dr. Riddell states, for in California it has been produced for three years at less than one dollar a barrel including all overhead charges. This is far below the average cost of American well oil.

The question as to what is to become of the vast amount of spent shale that will result with the development of the industry is puzzling many theorists. The by-products can be used for making pressed, refractory and insulating brick and tile, Dr. Riddell says, and at present it has found lesser uses as road material, concrete building blocks and as a filtering substance in the sugar industry.

That the new shale industry is destined to become as great as the coal industry is now, is recognized by engineers and geologists generally. The new business will be developed in the now sparsely populated regions, Dr. Riddell points out, and towns, roads, water systems, movies and other kinds of civilization will appear there.

PREDICTION OF LESS MEASLES

NEW YORK CITY and some other large cities this winter will be comparatively free from measles, judging by records of recent years. Last winter was a heavy measles year in New York and, from the findings of the Health Department, the city alternates its measles ratio from year to year. A year in which many children catch measles is followed by one in which most children escape the disease.

The reason for this variation is explained by Dr. William H. Park, director of the Bureau of Laboratories of the City's Health Department. During an epidemic year, he says, a moderate number of the city's school children catch measles. They carry it home to their younger brothers and sisters. Those who are old enough to run around spread it to others. The city is ravaged with the disease. The next year these children are immune to measles. Those who lack immunity are mostly babies from six to twelve months old. The number of cases developing falls sharply, and the city escapes a heavy epidemic. But the following winter changing population in a great city brings a new crop of "run-arounds" who have never had measles. In the schools there will be a certain number of pupils from out of town who likewise have never had the disease. Another measles year is due. And so the process repeats itself.

So far this winter, New York City is averaging twelve cases of measles a week. Last winter it averaged more than 200 a week. In 1925, the previous year of immunity, there was only one death from measles in the city during January. Last January there were fifty-nine deaths.

In smaller communities the epidemic years are apt to be farther apart as there are fewer chances for children to come in contact with the measles germ.

ITEMS

A NEW record for wind velocity recorded by weather bureau instruments was hung up in the Miami hurricane on September 18, 1926, Benjamin C. Kadel, in charge of instruments at the Weather Bureau in Washington, told members of the American Meteorological Society. At 7:40 A. M., the wind blew with a speed of 132 miles an hour, which was the highest recorded then, or ever before, he said. This speed corresponds to a pressure of 57 pounds per square inch instead of the normal 15 pounds. Thirty-two minutes later the wind gauge was blown down. The importance of this record, Mr. Kadel said, is that the center of the storm passed within a mile of the wind gauge, and that this gives engineers some idea as to how fast the wind blows within a hurricane.

GRADUALLY science is uncovering every step in the complicated life history of the tick that causes Rocky Mountain spotted fever. Dr. Roscoe R. Spencer, of the U. S. Public Health Service, who has already discovered much of the complex cycle of the organism causing the deadly disease, told the American Association for the Advancement of Science that the virus has a dormant stage in hibernating ticks. At this period the virus is not capable of producing the disease but will frequently confer immunization when injected in guinea pigs. In the spring after hibernation, when the ticks have had a meal of blood from an animal victim, the virus undergoes a highly fatal phase, but from it at this time, explained Dr. Spencer, a protective vaccine can be prepared. When it has been transferred to an animal's blood by the tick's bite it is less virulent than the active tick virus, but at this stage no protective vaccine can be made from it, he asserted.

HALF the forest fires that occur are caused by lightning, H. T. Gisborne, of the Rocky Mountain Forest Experiment Station, told members of the Society of American Foresters. Lightning's nearest rivals, "campers and smokers," as a source of forest fires are responsible for only 13 per cent. of all the forest conflagrations. Consequently weather and weather predictions assume a position of paramount importance in the field of forest fire research, declared Mr. Gisborne. Though weather forecasting is in the field of meteorology, the assistance of foresters is necessary in collecting data concerning the relation of weather elements and fire behavior. The U. S. Weather Bureau has already entered this field with all the force permitted by its finance but the cooperation of foresters is essential, stated Mr. Gisborne.

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SCIENCE NEWS

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PREHISTORIC MAN IN EAST AFRICA

By E. N. Fallaize

Secretary, Royal Anthropological Institute, London

A discovery which may prove of the greatest importance in helping to solve the problems of the distribution and migration of early man in Africa is announced from Nairobi, Uganda.

L. S. Leakey, a member of the Cutler Expedition which is searching for the remains of dinosaurs in East Africa, has been specially detailed to investigate the archeology and early history of man in Uganda. He has now found a complete human skeleton at Nakuru buried in the flexed position, with knees drawn up to the chin, at a depth of twelve feet. With the skeleton were over a hundred stone implements described as "Mesolithic," being mostly lunates (crescent shaped) and backed points of obsidian with a few bone points. The depth at which the skeleton was found and the character of the stone implements found with it would seem to indicate a very great antiquity, though how old it is, it is not yet possible to say.

The skeleton is that of a six-foot man and is said to be "not negroid." The skull has a nose of medium width and the jaw is not thrust forward. In life this man, therefore, did not have the broad flat nose and the projecting jaw characteristic of the usual negro type.

This is not the first discovery relating to early man to be made in Uganda. Just before the war a skull was found which was thought to be of a very early age and indeed in the view of some scientists it was thought it might even go back as far as the Old Stone Age and possibly be contemporary with stone age men of Europe. Numerous discoveries of stone implements have also been made. Although it is not possible, owing to the difference in geological conditions, to say with certainty how these implements compare with those of the Paleolithic Europe in actual dating in terms of years, in type the large chipped implements of rougher and heavier form, belonging clearly to the earliest phases of the Stone Age in Uganda, are similar to those of the early stages of the European Paleolithic Age, and are to be compared with the early implements found in other parts of the world wherever evidences of the existence of the Stone Age have been found.

In connection with the present discovery, however, the most interesting implements which have been found are the series of pygmy implements discovered in Uganda by Mr. Wayland, the government geologist, which are of the same type as the lunates and backed points or small knives of stone found with the skeleton at Nakuru. The diminutive implements, most of them less than an inch long, are characteristically of a very definitely geometrical form, often triangular, and are very widely distributed all over the world. They have been found in India, the Sudan, North Africa, Australia, Central Asia, and of course, Great Britain and most of the other countries of Europe, especially France. The culture to which they belong is called Azilian from a site in France, Mas d'Azil, a rock shelter in which they were first found. In date they belong to the transitional period between the Old and the New Stone Ages which, in Europe, falls perhaps somewhere between 9,000 and 7,000 B. C. It can not be said whether the Azilian implements found outside Europe are all as old as this; probably they are not. But it is possible that further research in East Africa may show that we have here in this discovery a branch of the Azilian race migrating south at a date not much later than that when this culture flourished in Europe. It is hoped and expected that the Kenya Government will assist Mr. Leakey with a money grant to carry on his researches for which further help is urgently needed.

INCREASE IN THE NUMBER OF INDIANS

According to Albert B. Reagan, expert on Indian affairs, who has lived among various tribes of the American aborigines for many years, there are at present 349,595 Indians in the United States, an increase of 16,585 or approximately 4.8 per cent. in ten years.

The Navajos of the Southwest, commonly thought of as the tribe most rapidly dying out, show themselves to be one of the most rapidly increasing. They numbered a little less than 9,000 in 1869, but now muster a roll of about 38,000. The Cherokees of North Carolina show the most rapid increase during recent years, swelling their numbers from 7,914 to 1912 to 11,969 in 1926, or more than 50 per cent. in less than fifteen years. Other tribes, especially in the west, are reported to be in flourishing condition, the largest number being naturally in Oklahoma, where the Five Civilized Tribes alone total over 100,000.

Mr. Reagan credits the medical and educational activities of the U. S. Government with most of the improvement in the status of the Indians. In 1882, he says, there was only one hospital among the Indians; in 1900 there were five, and in 1925, eighty-two. These gave treatment to approximately 28,000 Indians. On reservations besides the medical aid and attention given the Indians by the school and agency people, there also are now 40 field matrons, 135 nurses and 181 physicians, besides eye, nose, ear and throat specialists and seven traveling dentists.

In 1775, the Continental Congress expended $500 for the schooling of the Indian youth at Dartmouth College, and the year closing we spent about $6,000,000 in the instruction of 67,000 Indian children, where medical supervision is attended to with great care, both in caring for them and in teaching them the laws of health and sanitation. In addition, the government has introduced modern sanitation methods of living into the Indian homes.

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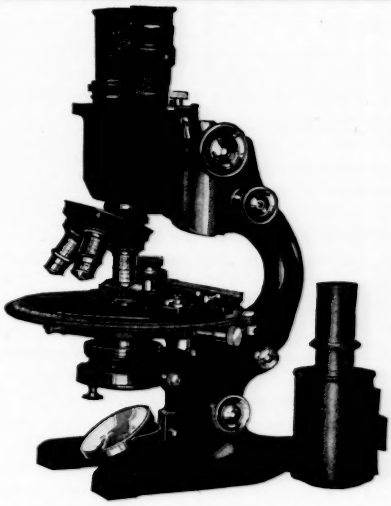

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ULTRA-VIOLET LIGHT FOR MOTHERS

If a baby develops rickets in spite of receiving his nourishment in the way traditionally supposed to be best for babies the anxious parents should not immediately put their young hopeful on a bottle. He can quite possibly be cured by having his mother treated with ultraviolet irradiations.

Although the great advantages of mother's milk are not questioned, Dr. Alfred A. Hess, of the Columbia University College of Physicians and Surgeons, has reported to the American Medical Association that from one third to one half of the breast fed babies met with in his experience in this climate have rickets. Working in collaboration with Mildred Weinstock and Elizabeth Sherman, Dr. Hess has conducted experiments that show that the antirachitic substances in human milk are greatly increased by irradiation of nursing mothers with ultraviolet rays. Though direct sunlight has been of great benefit in treating rickets, in this connection it has been found not to give as positive results as the quartz mercury vapor lamp, said Dr. Hess.

These experiments, he continued, suggest that irradiation of the mother while she nurses her baby will not only protect the baby from rickets, but will help keep up her own nutritional status. This is especially important because the excessive drain on the calcium and phosphorous content of the body often results in serious impairment of the teeth in young mothers. How effective and practical the method will be must be determined by further clinical experiments.

HEART EXTRACT BEAT

A "heart hormone," a physiologically powerful chemical compound secreted within the living heart and acting to keep it beating ceaselessly, has been discovered by Dr. Ludwig Haberlandt, of the University of Innsbruck. It is to be classed with the secretions of the ductless glands, such as the thyroid in the throat and the adrenals near the kidneys, which have far-reaching effects in the lives of men and animals, and some of which are now widely used in medicine.

Professor Haberlandt states that the existence of some such internal chemical stimulus to action had long been suspected, because frequently hearts removed from the bodies of animals kept on beating outside, which they would not have done had the stimulus been supplied by the nervous system alone. He found that extracts from a portion of the heart of the frog would act on the stilled heart removed from another frog, causing it to contract again. The extract was able to cause this reaction even in hearts that had been lying still in glass dishes for as much as three and one half days.

A similar extract from the hearts of dogs, having comparable effects, has been obtained in Brussels by Dr. J. Demoor, and is cited by Professor Haberlandt as proof that this "heart hormone," as he has named the compound, is of general occurrence among vertebrates and of physiological importance to warm-blooded animals.

The Austrian physiologist is of the opinion that his newly discovered hormone may come to have considerable importance in medicine, as a stimulant to weak hearts. He points out that an abundant supply is easily available in the hearts of animals killed for meat in the packing houses.

BACTERIA STANDARD FOR ICE CREAM

Science is on the trail of the germs that lurk in the ice cream cone. The time is not far distant when neapolitan bricks and the backbone of a maple walnut sundae will have to be as free, comparatively, from bacteria as milk sold subject to the jurisdiction of city health departments.

Dr. F. W. Fabian, of the Agricultural Experiment Station of Michigan State College, after extensive investigations of ice cream plants, says that 100,000 bacteria colonies per gram is the legitimate maximum of bacteria that ice cream should contain. Ice cream from some of the plants inspected ran as high as 300,000,000 colonies per gram when subjected to bacterial analysis.

"It has been demonstrated that it is not only possible but practicable for large ice cream plants to produce consistently ice cream containing 100,000 or less bacteria per gram over a period of several years," he stated. "Plants that consistently produce a product with a high bacterial count are careless in some fundamental operation which could be easily remedied. With a standard such as this it will be possible to grade such plants and place them accordingly."

Such a standard, Dr. Fabian explained, would be of great aid to health officers, sanitary inspectors and doctors, and would at the same time give credit to the manufacturers who make an effort to produce clean and wholesome ice cream.

CONTROL OF THE CORN BORER

The European corn borer, were it human, would undoubtedly be suffering from a case of the big-head. Probably never before has an insect been mentioned in a presidential address as was the corn borer, when President Coolidge called attention to the menace of the European corn borer in his recent message to Congress, saying that it "warranted the federal government in extending cooperation" to fight its spread. And now the House has voted a special appropriation of $10,000,000 to be used in a campaign to control the spread of the borer. This is quite aside from the $685,000 asked in the regular agricultural bill for research and quarantine of the pest by the Bureau of Entomology.

Contrary to a wide-spread impression, this $10,000,000 appropriation is not for the eradication of the borer. Government entomologists have no hope of such a thing as eradication. To eradicate the borer from the country it would be necessary to make of the infested area a desert, for the European corn borer attacks 225 different kinds of plants. Thus eradication is out of the question. The $10,000,000 appropriation is for an experimental clean-up campaign to reduce the chances of the corn borer's spreading throughout the corn belt by reducing the number of borers present in the infested areas. Last year was the first year that

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the corn borer did any real commercial damage in the United States, but the example of Canada, where the main corn belt is heavily infested and where 12,000 square miles suffered a complete loss of the crops last year, shows what the corn borer may do here in time unless steps are taken.

To be used this spring the money named in the special appropriation must be available by February first. This means that not only must the senate pass the bill and the president sign it, but the infested states must pass necessary regulatory legislation giving state and federal officials the authority to take action where the farmers refuse to adopt the prescribed method of treating the crop.

The plan is that the government shall bear the expense of any farm clean-up measures additional to ones followed by the farmer under normal circumstances. In other words, the government would pay for the extra labor and expense involved in the special operations necessary in infested areas. The government does not propose to stand financially for injuries to corn or other farm crops.

RADIO AND SUNSPOTS

RECEPTION of radio broadcast programs on fairly long waves generally gets worse as spots on the sun increase, but with short waves, of about 34 meters length, it gets better, Greenleaf W. Pickard told the Institute of Radio Engineers at their session here. Advantage has been taken of this phenomenon in the new transatlantic radio phone service, because the voice is sent from New York to London simultaneously on long and short waves, so that as transmission with the long waves gets worse, the short wave transmission improves.

Mr. Pickard has been studying the relations between activity of the sun, as indicated by the presence of sunspots, magnetic storms on the earth, and radio reception. He began the study in March, 1926, and has continued it to the present, measuring chiefly the reception from station WBBM of Chicago, which operates on a wave length of 226 meters. There is a very close correlation shown between the magnetic character of the days, as determined at the Cheltenham, Md., magnetic observatory of the U. S. Coast and Geodetic Survey, and the radio reception at the time. When the monthly averages are taken, there is no obvious relation between the sunspots and magnetism of radio reception, said Mr. Pickard, but when weekly averages are used "an increase of solar activity is paralleled by an increase in magnetic disturbance and a decrease in reception."

"It is perhaps unlikely that any high correlation between reception and weather elements will be found," he continued. "Solar disturbances and magnetic storms are world-wide events whereas weather is rather a local matter. Analysis of weather elements over the whole earth indicate that there are areas of positive correlation with sunspots, and also areas of negative correlation. Although I have not yet collected and analyzed reception data from any such collection of receiving points as would fairly represent the earth as a whole, I have found that a bad night for reception in Newton Centre is in general a bad night anywhere in the United States. And I have also found that European reception of distant broadcast stations agrees remarkably well with my measurements of WBBM. I find that in general, reception is most affected when a spot or group of spots is near the center of the solar disk, that is, when they most nearly face the earth, although there are exceptions.

ITEMS

CITIES throughout all sections of the country infested with white ants should follow the lead of Honolulu and several others and modify their building codes to include proper protection from these wood-destroying insects. A plea to this effect was made by Dr. Thomas E. Snyder, of the U. S. Bureau of Entomology, at a recent meeting of the American Association of Economic Entomologists. In order to save the public from large expenditures of money, this is absolutely necessary. Honolulu yearly has paid out a million dollars to restore buildings invaded by white ants whose ravages are invariably costly wherever they occur. Insulation of all untreated woodwork from contact with the ground will protect buildings against subterranean white ants. Against the non-subterranean species the interior woodwork and furniture must be treated with chemical preservatives.

DEVIL'S LAKE, famous scenic region in North Dakota, has now attained a new distinction: it marks the center of the North American continent. The Map Information Office of the U. S. Board of Surveys and Maps has finished a new determination of the geographic center of North America, as accurate as can be obtained from the most recent maps. This estimate places the spot at 48 degrees 10 minutes north latitude and 100 degrees 10 minutes west longitude. This is a few miles to the west of Devil's Lake, but the lake is the nearest prominent feature on the map, and so becomes a natural center monument.

FEEBLY crawling in a small tank at the O'Rourke Zoological Institute in Balboa Park are fifty tiny crawfish which may be the only members of a rare species alive anywhere. The crustaceans were hatched from eggs laid by a specimen brought by Mrs. George Waring from Spook Canyon near Escondido, California, which excited the curiosity of naturalists as being a new and rare variety. Several days later the canyon was swept by a brush fire which dried up pools and mud. The crawfish are believed to have been exterminated. Preserved specimens are held by the Natural History museum and the Smithsonian Institution of Washington, but those at the Zoological Institute are the only ones known to be alive. The adult specimens were large and red and at first believed to be sea lobsters. Extreme precautions will be taken to preserve the hatch of fifty or more, and if animal life is found to be exterminated in Spook Canyon, the waters there may be restocked. The new species has not been named.

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SOME PAPERS PRESENTED AT THE PHILADELPHIA MEETING

From press telegraphic reports.

MEMORIES in rats after operations on the brain have been studied by Dr. K. S. Lashley, of the Institute for Juvenile Research, Chicago, and were reported to the American Psychological Association. Many of our universities in recent years have added departments of rodent-education in which the course is that branch of activity in which rats have shown themselves proficient in all ages, that is, finding their way through tortuous passages. The rat to be trained is put into one corner of an artificial maze and set to find his way to his food in some other compartment. When he is able to run rapidly through the passages without hesitation, turning into a blind alley, he is credited with having learned his lesson. Dr. Lashley has discovered that this acquired proficiency can be eradicated by cutting out certain parts of the brain, particularly in the parietal region. The larger the area injured the greater is the number of trials required for relearning the lost lesson. When the cerebral lesion is extensive more practice is necessary for relearning the maze than for learning it at first, but other and simpler habits are formed as quickly as ever. The investigator concluded that the maze habit is relatively independent of the activity of specific neurons, but somehow depends upon the massed activity of the greater part of the brain. Obviously such studies of the localization of various forms of cerebral action in rats may throw light upon the cause and cure of mental diseases in man.

IS it a masculine trait to be abrupt and outspoken, and is it feminine to be vain of one's personal appearance? If a man is vain is he feminine to that extent, and if a woman is abrupt in manner is she more masculine than the average individual of her sex? Such questions as this on sex differences may be answered, when a series of tests now being conducted at Stanford University is completed. Dr. Lewis Terman, who has just reported progress of the investigation to the American Psychological Association, states that very little is now known as to the differences between sexes in abilities, talents and character. The investigators aim to find out where the differences really lie, and how they may be measured. Definite information may settle the age-old controversy of whether the extremely masculine type and the clinging-vine feminine type really make the best matrimonial combination, the psychologist suggested. Tests so far given indicate that popular ideas as to what a boy or girl is interested in are often far from accurate. It was hardly expected, Dr. Terman said, that females would excel males in liking civics as a study, or in their interest in public speaking. Nor was it expected that the boys would excel the girls in knowing what the Mona Lisa refers to, and in telling what kind of costume the Colonial Quakers wore. But such is the case, the tests show.

A PIECE of the mineral molybdenite, one of the chief sources of the metal molybdenum, used in steel manufacture, may replace the fragile photoelectric cell in some forms of scientific work, Dr. W. W. Coblentz, of the U. S. Bureau of Standards, told the American Astronomical Society. Dr. Coblentz has been studying what he calls the antinoelectric effect of molybdenite, the property that causes it to convert light energy falling on it into electrical energy. Previously he found that pieces of the mineral have closely adjacent spots which generate either positive or negative electricity. The result is that when the whole crystal is exposed to light the positive and negative currents neutralize each other, and very little effect is noted, but if a single one of the spots is selected and illuminated, a current is produced of sufficient intensity to be indicated with a galvanometer. Very recently, however, Dr. Coblentz has found crystals in which all the sensitive spots give the same kind of electricity, either positive or negative. When one of these crystals is completely illuminated, a considerable current, as compared with the others, is produced. By using vacuum tube amplifiers, such as are used in radio, the current may be magnified greatly and the crystal made available as a delicate detector of light. Such a crystal is sensitive to the visible light waves and to the infra red, or heat waves, which are similar, but vibrating too slowly to be visible.

THE suggestion that the earth can not be relied upon to stay the same size, but that it swells and shrinks at irregular intervals was made by Dr. Walter D. Lambert, of the U. S. Coast and Geodetic Survey. Such a variation in the size of the earth would alter its rate of rotation and so upset our universal time-piece, for the length of day is our measure of the lapse of time. Professor E. W. Brown has pointed out that such a variation in our unit of time might account for the apparent irregularities in the motion of the moon that have made it impossible to predict exactly where our inconstant satellite will turn up at an eclipse. Dr. Lambert thinks it may also account for inexplicable variations in latitude or what is the same thing, the apparent wandering of the pole. For some years prior to 1918 the north pole appears to have moved progressively toward North America and then to have turned aside without apparent reason and moved toward Europe. Comparatively slight expansion and contraction of various parts of the earth's surface might account for such disconcerting discrepancies in our standards of time and space.

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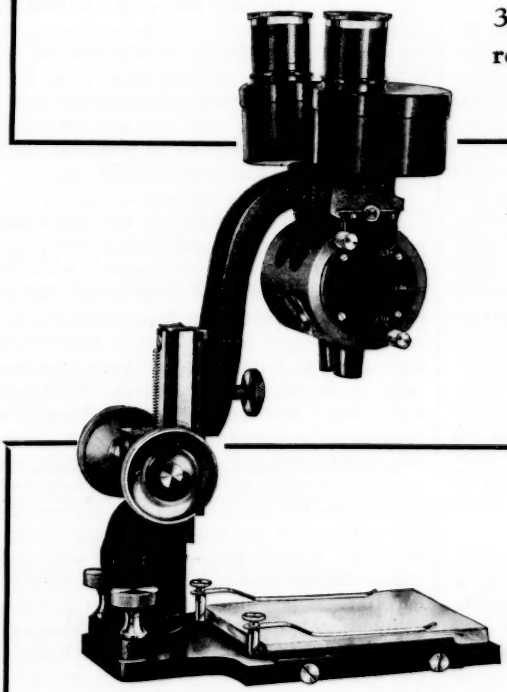

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until the end of 1927 or the beginning of 1928, according to Miss Hazel M. Losh, of the Mt. Wilson Observatory, California, who reported researches made jointly with Dr. Seth B. Nicholson. Sun spots were at a minimum in 1923 and since then they have been increasing in number. During the last few months the solar activity has been about as great as in 1917, when the last maximum occurred. But there is this difference. In 1917 the spots were near the equator of the sun, as they always are when the cycle has reached its height. This fall the spots, though numerous, have beeen nearer the poles of the sun than in 1917, and this indicates, it was said, that the maximum has not yet been reached. If the maximum comes about a year from now the sun-spot period will be only about ten years long, a year shorter than the normal period.

SUCH a variation in sun-spot cycle may have occurred in the past, Dr. A. E. Douglass, of the University of Arizona, told the astronomers. His researches show a relation between tree rings and sun activity. From 1748 to 1788, for example, his studies of trees show that there were four cycles of ten years each, while in the following forty-two years there were only three cycles of fourteen years each. Dr. Douglass's studies are based on the fact that the tree rings, which represent growth of a tree during the year, vary in thickness with the amount of moisture that they receive during the growing season, and that rainfall varies with the sunspots. So by studying old trees, such as the giant sequoias, in California, and other old trees in Arizona, the past activity of the sun may be traced.

A SOVIET scientist, Professor A. Tchijevsky, of Moscow, says that important historical events have a tendency to occur at eleven-year intervals which very closely coincide with the rise and decline of spots on the sun. The ideas of the Russian archeologist were explained to the American Meteorological Society by Dr. V. P. De Smitt, of Columbia University. In support of these ideas, Dr. De Smitt displayed a chart where one curve represented the number of sunspots from 1749 to 1923, and the other "universal human military-political activity," the two curves closely paralleling each other. A sunspot maximum in 1780 coincided with the height of the American revolution, one in 1848 coincided with revolutionary activity in Europe, one in 1870 with the Franco-Prussian war, and one in 1917 with the great war and the Russian revolution. "The maximum of sunspot activity," said Dr. De Smitt in summarizing Dr. Tchijevsky's views, "favors the excitability and uniting of the masses for attaining a certain general necessity brought forward by economic or other causes, and brings forth mass actions and leaders. But these acts are not inevitable; all depends upon previous events. For example: if a war is already in progress from the previous period, the general excitement may assume the form of ardor for peace at any price."

DR. OSCAR RIDDLE, of the Carnegie Institution for Experimental Evolution at Cold Spring Harbor, Long Island, N. Y., who will be remembered as the scientist who discovered mamma pigeons that had changed into papa pigeons, declared that "sexuality rests initially on metabolism." Using a blood test for sex that was devised by a Russian, Dr. E. O. Manoilov, it was found by Dr. Riddle that when the father pigeon is engaged in incubating the eggs during the daytimes of the nesting period, his blood gives the test for femaleness in a large number of cases. This is because during this period the male is relatively inactive, a condition that is a feminine attribute. Determinations of the speed of living of the two sexes show that the male normally burns up his food into energy faster than the female. Similar studies by other workers at Cold Spring Harbor have shown that plants show with age greater sex differentiation. The Manoilov test applied to plants and trees demonstrated that the young and blooming plants have less sex differentiation than those that have passed into the decline of their existence when their leaves have begun to turn yellow.

A LIVELY discussion among the anthropologists was precipitated by the recent announcement of Dr. Paul Rivet, of France, which, if accepted, would force scientists to revise all their ideas about the earliest inhabitants of America. Dr. Rivet believes he has evidence on the languages of the Malays, Polynesians, Melanesians and even Australians indicating that they were related to the Indians of America. This theory which would imply that long-distance sea voyages were taken by these early races was attacked by Dr. Truman Michelson, of the Bureau of American Ethnology, who has just completed a study of Dr. Rivet's evidence and who pronounced the few similarities found between the words of the islanders and the Indian to be only chance likenesses. Professor Roland Dixon, Harvard anthropologist, declared that the French scientist's material is sufficiently important so that it deserves serious consideration, but, he added, "I am by no means sure that he is right." Professor Dixon pointed out that the Hokan Indians of the west coast and the Melanesians are still very little understood, and that basic study of these peoples is needed before connections of early Americans with other races can be determined. Dr. J. R. Swanton, of the Bureau of American Ethnology, expressed the opinion that a great many more languages are related than we now realize. But he stated that he has found not the slightest positive evidence of relationship between the language of American Indians and the speech of Australian or Polynesian tribes.

THE heart beats of plants which Sir Jagadis Chunder Bose claims he has demonstrated are mere figments of a romantic Oriental imagination, unsupported by any genuine scientific fact, according to Dr. D. T. MacDougal, of the Carnegie Institution of Washington. Together with Professor J. B. Overton, of the University of Wisconsin, Dr. MacDougal discussed the problems of the uphill flow of water in trees, and took occasion to criticize the statements of the Indian savant in the sharpest terms. "An examination of the assertions of Sir J. C. Bose that sap is pumped upward by pulsating action of living cortical cells has been made," he stated. "Bose's

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claims as to the rate and mechanism of sap movements ignore well-established anatomical and mechanical facts, and are based upon imagined, but impossible hydrostatic action of living cells. No single direct observation nor any measure of pulsatory action has even been made, by Bose or any one else, yet an explanation of the ascent of sap is based on such an idea.'' After characterizing Bose's claim of a rate of pumping which would take a drop of water through the plant's tissues at the rate of from two to four hundred living cells a second as ''too fantastic for serious comment,'' Dr. MacDougal continued: ''When Bose's suggestion that these pulsations may be the result of stimulation by friction of the roots with soil particles it is realized that the passage from pseudo-research to infantile fancies is an easy one.''

WAKING up plants with narcotics is the latest novelty in agriculture. That small doses of ether or chloroform would stimulate plants has been known for some time and now R. B. Harvey and his associates at the University of Minnesota have found that the newer anesthetics, ethylene and propylene, are still more effective. In experiments described before the American Society of Plant Physiologists they showed that the sprouting of certain varieties of potatoes could be speeded up by putting them previously to planting in an atmosphere of one of these gases in the proportion of one to a thousand. Gladiolus was also hastened. Cuttings of apple, cherry, pear, grape, currants and other trees and bushes, seeds and bulbs of various sorts, broke their dormancy on inhalation of the gas. Bananas, grape fruit, avocadoes, tomatoes, dates and other fruits ripen more rapidly. Pineapples gain in their digestive juice and persimmons lose their astringency. By this means it may be possible to ripen fruit only three fourths grown in a day or so in order to meet the early market or save it from loss when frosted. Propylene is even better than ethylene, but is not yet on sale.

HOW to make our forests more efficient is the aim of the novel investigations carried on in the Rocky Mountain Forest Experiment Station at Colorado Springs by C. G. Bates and J. Roeser. By growing seedlings of various kinds of evergreen trees on a table under the light of tungsten-filament blue-glass lamp for ten hours a day for nine months they determined the limit of light essential for the development of each kind of tree. They found that some species were five times more efficient than others at trapping the roving rays and utilizing their energy for construction purposes. The California redwood ranked first in efficiency as light-catcher for it could keep alive with less than four fifths of one per cent. full noon sunshine. Engelmann spruce and Douglas fir ranked next with one and a quarter per cent. Most of the pines require two to three per cent. while the scrubby pinon of the Colorado foothills failed to flourish with even thirteen per cent. of sunlight intensity. This accounts for the phenomenal ability of the redwood and spruce to make rapid growth in shade of deep timberland and shows why they have outstripped many other trees in evolutionary development. He concludes: ''Broadly speaking we can not afford to give space in the forest to a species which is relatively inefficient in photosynthesis, unless it is producing a wood of exceptional technical value.''

A CHEMICAL method of determining the character of a person was explained by Dr. Gilbert J. Rich, psychologist of the Chicago Institute for Juvenile Research. He finds that the type of temperament is somehow correlated with the composition of the bodily fluids. Good-nature, excitability, aggressiveness and leadership were the traits of personality considered in experiments on university graduates and undergraduates and children. They were ranked according to these traits by those who knew them well and chemical analyses made of their saliva, blood and urine. It had been previously shown that various types of insanity could be distinguished by such tests, and Dr. Rich's results indicate that they may also be of use in analyzing the character of normal individuals.

THE old question, which used to be so hotly discussed by theologians and philosophers, of whether the earth is in the center of the universe is decided by Frederick H. Seares, of Mount Wilson Observatory, in the negative, by his measurements of the distribution of stars in various directions. He finds that our solar system is about 4,000 light years, or twenty-four thousand million million miles, from the center of the watch-shaped cluster of some thirty billion stars which we call the Milky Way.

HOW the same figures, by a simple movement of the decimal point, can express the vast distance of a star from the earth and the minute distance between two atoms in a pinch of salt was explained by Professor Alexander McAdie, of Harvard University, as an argument for the metric system of weights and measures. Expressed in meters, the distance between salt atoms is 281 with a decimal point and nine ciphers in front of it. Move the decimal point 28 places to the right and there results the number of meters that a star, distant 300 light years, is from the earth.

PROVING that freaks of nature, such as four-legged chickens and two-headed calves, have scientific as well as popular interest, Dr. F. E. Chidester, of West Virginia University, reported upon the anatomy of such malformed creatures. One chicken examined had four wings as well as four legs. Although the kidneys were doubled in some cases, the gizzard, heart and respiratory apparatus remained single.

DISSECTION and microscopic study of two Peruvian mummies dating back to about 700 A. D. revealed examples of red blood corpuscles, quite fragile structures to have survived so long a time, it was reported by Dr. Herbert U. Williams, of the University of Buffalo. Dr. Williams also found by dissection arteries, nerves, muscles and tendons which could be readily identified. His findings, he stated, indicate that much could be done by study of such mummies to determine the diseases of early American races, especially diseases of the chest and abdomen.

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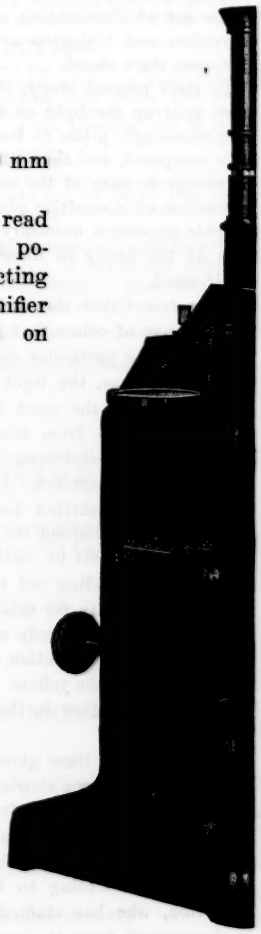

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SCIENCE NEWS

Science Service, Washington, D. C.

COLD LIGHT

THE "cold light" of living things, such as fireflies, and the bacteria and fungi that cause rotten wood to glow in the dark, has been made the subject of scientific measurement by Dr. W. W. Coblentz and Dr. C. W. Hughes, of the U. S. Bureau of Standards. These humble organisms are so much more efficient in getting light out of a given amount of energy than the best incandescent lamp which man has yet devised that they are at once the admiration and the despair of scientists, and they may some day furnish a hint that will revolutionize the whole art of illuminating engineering. For this reason physicists and biologists are always at them, trying to pry open their secret.

In their present study, the two government scientists have split up the light of these organisms by means of a spectroscopic prism to learn accurately of what colors it is composed, and they have also measured the amount of energy in each of the color bands with a device that makes use of a sensitive photographic plate. The photographic exposures necessary varied from an hour in the case of the firefly to three days with pieces of "fox-fire" wood.

They found that the various organisms varied widely in the range of colors that go to make up their light, as well as in the particular color most intensely present in the glow. Thus, the light of "fox-fire" wood, which comes not from the wood but from a fungus in it, included all colors from blue-violet down to red-orange, with the highest intensity in the green, and a smaller high point in the yellow. In a certain glowing sea-creature the range shifted toward the violet end of the spectrum, going beyond the light of the "fox-fire" and almost to the limit of visibility, but stopping short at orange and excluding red at the lower end. The point of highest intensity for this animal's light was a slightly greenish blue. The firefly with which they experimented had an uneven distribution of color in its spectrum, but was strongest in the yellow. They also tested certain zinc compounds that glow in the dark, for purposes of comparison.

The light from these glowing animals and lowly plants does not come from a slow combustion of their substance, as was once supposed, but from a sort of digestive process which involves a special material secreted by the organism and a special enzyme that works upon it and causes it to shine, according to Professor E. N. Harvey, of Princeton, who has studied this phenomenon of "bioluminescence" from the biological point of view. When these two things come into contact, other conditions being favorable, the light appears. It is also possible to take the "luciferin" of one animal and cause it to glow by adding the enzyme, or "luciferase" of a different species.

IMMUNITY TO MEASLES

WHEN either measles or whooping cough make their appearance in a German family it is the current practice to prevent those diseases or to forestall serious complications by inoculating the exposed children with blood from their parents, according to Professor Rudolf Degkwitz, who is director of the children's clinic at the University of Greifswald in Germany and is engaged at present in research on measles at the U. S. Public Health Service.

In the densely populated countries of Europe, he explained, the chances of reaching full-grown manhood or womanhood without contracting measles or whooping cough are very small. It has been established, he said, that the periodic subsequent exposures to both diseases resulting from the contacts of every-day life stimulates during the whole life production of antibodies in the blood. Consequently the blood of most of the adult population of Europe or of any big city in any country is a convenient immunizing agent that can be used to prevent those diseases or to mitigate their severity in children.

"When a German child 'comes down' with either whooping cough or measles," said Professor Degkwitz, "the physician uses the blood of the father or mother to inoculate the other children in the family. When this is done early enough in 50 per cent. of the cases treated the diseases are prevented and an immunity for several months is established. In the other 50 per cent. very mild forms of the disease ensue that confer as lasting an immunity on the young patient as a severe case. Measles and whooping cough in such cases are so mild that as a rule the children do not feel ill at all and can not be kept in bed. Since the efficacy of this method depends on its early use, German health authorities are endeavoring to teach this vital point to parents through propaganda distributed to school children." The health section of the League of Nations likewise advocates this mode of treatment.

Professor Degkwitz has been working with an animal serum to be used as a measles preventive and curative which is made from the blood of immunized sheep. To obtain the best results it should be administered the first day of the disease, when the temperature begins to rise. He claims that the serum administered at this time prevents measles and finishes the fever after 24 to 36 hours or else modifies the disease to a very mild form. In both cases a lasting immunity follows. The serum is on the market in Germany and is being tried out experimentally in England and other countries. British health authorities, however, maintain that up to the present the reports on the uses of the serum have not shown satisfactory results.

THE PREVALENCE OF CANCER

CANCER data recently collected for fifteen different cities in the United States and Canada are revealing some

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striking new facts. Perhaps the most suggestive is the wide variation disclosed in cancer incidence by different organs and parts of the body in different sections of the country. For men, the death rate from cancer of the stomach was 45 per 100,000 for San Francisco and only 19 for Buffalo. For cancer of the esophagus the rate was 7.7 for men in San Francisco but only 4.2 for white men in New Orleans. For cancer of the larynx, the rate was 5.1 for white men of New Orleans but only 2.0 for men of Buffalo. Cancer of the pancreas prevailed to the extent of 4.6 for San Francisco, but the rate was only 1.2 for white men of New Orleans. The rate for cancer of the breast was 29.7 for women of Albany and 26.4 for women of Boston, against 18.8 for white women of New Orleans and 15 for women of Buffalo. Mortality from cancer of the uterus was 52.9 for colored women of New Orleans, 33.7 for women of San Francisco and 26 for women of Chicago.

The extended investigation is being carried on by Dr. Frederick L. Hoffman, consulting statistician of the Prudential Insurance Company, who has the cooperation of fifteen American and Canadian cities and three Canadian provinces. The investigation includes attention to living cancer patients, of which some 3,000 have been reported upon.

Among other facts disclosed is the apparent increase in cancer of the lungs. As a general rule, cancer and tuberculosis rarely coincide in the same person.

Dr. Hoffman's Canadian investigations show that French Canadians have a much lower cancer death rate than English Canadians. As yet, no satisfactory explanation for this difference has been forthcoming. Cancer of the lip and mouth is apparently more common among French Canadians in Montreal than among the remainder of the population, but cancer of the esophagus and gall bladder is less common. Cancer of female organs is also decidedly more infrequent among French Canadians than among other Canadians in Montreal. The investigation is being extended to other sections of Canada as far as the Pacific Coast.

THE CONSERVATION OF GRASS

"SHOULD this harvest of grass fail for a single year, famine would depopulate the land." With this excerpt from a speech of the late Senator Ingalls as his text, Will Barnes, of the U. S. Forest Service, painted a vivid picture of the importance and romance of the grasslands in the history of the American nation, before the New Haven meeting of the American Forestry Association.

The cow is the foster-mother of the race, and her sons have hauled the ponderous covered wagons of its migrations and pulled the plows that broke the pioneers' first furrows, Mr. Barnes reminded his hearers; and where cattle are to go, there must be grass. Many of the finest of the grasses in the older parts of the country are naturalized citizens: the brome grasses, orchard grass, even the famous Kentucky bluegrass; but out on America's real grasslands in the West there are none to equal the native gramagrass and curly mesquite and bunch grasses.

"No other country has such valuable winter ranges as we have throughout the arid regions of the far West, where the native grasses grow in regions of extremely limited rainfall," according to Mr. Barnes. "They cure on the ground equal to hay, furnishing feed for livestock during the winter months. Neither are there any other countries of which we know that can claim such areas of purely summer range as are found in our West in the high mountain regions, where the lush feed grows with astonishing rapidity in the spring. All this must be removed from these ranges each season or be lost forever.

"As with all our other resources, however, we Americans have been wanton destroyers of our grasslands, mainly through overgrazing. To-day this country has nearly 180 millions of acres of strictly grasslands—areas which under no known system of cultivation can ever be used for any purpose other than grazing livestock. This is an area larger than our largest state, Texas. Even at the low valuation of $2 an acre it means over $300,000,000 worth of public property lying idle and deteriorating in usefulness—a liability rather than an asset."

Mr. Barnes appealed for a scientific program of development for American grasslands. Conservation measures, he pointed out, are now effective in all the public domain except only in the grazing country, where they are of immediate and pressing importance.

ADVERTISING TO AID PARKS AND RECREATION

NEW ENGLAND plans to recoup a part of her threatened prestige in industry by getting full value out of her "stern and rockbound coast" and the "murmuring pines and the hemlocks" of her forests as national recreation grounds; and she intends to tell the world about them, through a scientifically planned campaign of advertising.

The value to this picturesque and historic section of the country of what he termed its "intangibles" was discussed recently by Albert M. Turner, field secretary of the Connecticut State Park and Forest Commission, speaking before the annual convention of the American Forestry Association at New Haven. Mr. Turner announced that as an engineer he had always been used to dealing with things of strictly tangible value, but that he has come to realize the "use" of beauty and that his section had lagged behind the rest of the country in providing areas for the specific purpose of recreation.

"New England has two per cent. of the land in the United States, seven per cent. of the people and nine per cent. of the wealth," he stated, "yet of public land available for recreation we have now only one half of one per cent. and this in spite of the fact that we have twenty-five million acres of land, or sixty per cent. of our total area, in wooded lands. The people of the United States have now set aside or acquired a hundred and forty-seven million acres of public park and forest, or almost eight per cent. of the land area of the forty-eight states, and they are steadily acquiring more."

The ratio of public land available for recreation is greater in the West, Idaho heading the list with thirty-three per cent. of her total area, while the percentage is "almost nothing in certain states that need not here be advertised." Yet the East is not wholly asleep, for

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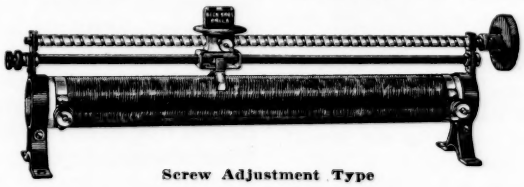

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Mr. Turner disclaimed any intention to lay down details of a scheme for "parking" New England, but he recommended that "for the benefit of its own people, its own timber supply and its own watersheds, the section should promptly begin to formulate plans for the acquisition of at least eight or ten per cent. of its land area, or from three to four million acres."

THE ANTI-EVOLUTION STATUTE OF TENNESSEE

VIOLATION of Tennessee's anti-evolution statute is now virtually impossible, under the interpretation placed upon the much-discussed law by the state supreme court, according to Henry E. Colton, counsel for the Tennessee Academy of Science in the appeal from the decision of the lower court after the Dayton trial. The only way in which a Tennessee teacher could now force himself into the law's clutches would be by directly inculcating doctrines of materialism or atheism in connection with evolution. Evolution pure and simple he can teach as much as he pleases, so long as he leaves religious denial out of the discussion. "The supreme court has rather clearly indicated that it wishes to get rid of this case, and the attorney-general is apparently likewise of the opinion that it is to the best interest of Tennessee not to prosecute this case further," Mr. Colton says. "In fact, under three opinions rendered in the case by the four judges now living it would seem probable that the state could not obtain a conviction in this case unless upon retrial and reappeal to the Tennessee supreme court it should win over the fifth judge, Swiggart, who did not participate in the case.

"An examination of the record indicates that John Thomas Scopes taught the generally accepted scientific theory as to the evolution of man without in any way denying the divine origin of man. Under liberal interpretation of the Biblical stories there is no conflict between the scientific theory of the evolution of man and the Biblical stories which teach the divine origin of man but do not specify the gradual process by and through which he was created.

"Two of the judges, Chambliss and McKinney, have held in substance that the mere teaching of the scientific evolution theory as to the origin of man does not constitute a crime under Tennessee law. Judge McKinney so holds because in his opinion the Anti-Evolution Act is unconstitutional for uncertainty. Judge Chambliss so holds because in his opinion the contention of the defense is correct that the teaching of the generally accepted scientific evolutionary theory as to the origin of man is not made an offense under the Anti-Evolution Act unless the teacher goes further and denies the divine origin of man. In other words, Judge Chambliss construes the statute as condemning the teaching of materialism or atheism, but not as condemning the mere teaching of the scientific theory of evolution of man as generally taught. Under the foregoing circumstances and facts, if the state, after having spent thousands of dollars in the prosecution of Scopes, sees fit to dismiss Scopes without undertaking to convict him, it seems scarcely worth while for the defense to run the risk of antagonizing the court by arguing for a further hearing when it has already for all practical purposes won two out of the four judges now living who heard the case, and the state seems to be so tired of the prosecution that it is of its own accord dismissing the indictment against Scopes; and when it is known to all the world that he has taught the scientific theory as to the evolution of man.

"If the state does not have sufficient confidence in the act to proceed against Scopes under the foregoing circumstances it seems questionable whether it will ever undertake to enforce the act unless a teacher should not only teach the scientific theory as to the evolution of man but go further and undertake to teach materialism and deny the divine origin of man."

ITEMS

THAT the wave of influenza that has been sweeping over Europe is settling down before it touches our shores is the conclusion reached by officials of the U. S. Public Health Service based upon failure to receive further information on the progress of the epidemic. Both the Epidemiological Intelligence Department of the League of Nations and the Health Organization in England announced their intention recently of broadcasting radio reports on the character and progress of the disease. Up to date, however, no reports have been picked up, Surgeon-General Hugh S. Cumming declared recently. The fact that the Arlington Naval Wireless Station has been unable to pick up any of the signals for the Public Health Service is interpreted as meaning that the epidemic is subsiding and that no bulletins have been sent out from the European stations. The decision of the health section of the League of Nations to make available by broadcasting the information received by extensive epidemiological intelligence section it has been building up, was determined, it is said, by the numerous inquiries received from all over Europe as well as Australia and the United States.

NICOTINE, thus far practically unrivalled as an insecticide against plant lice, may soon have a serious competitor in the field through the results of experiments carried on at the U. S. Bureau of Entomology. An oil prepared from pyridine, which forms an essential part of nicotine, combined with sodium, has been found to be poisonous to plant lice. Like nicotine it destroys the lice without injuring the infested plants. Entomologists believe it possible that dipridyl oil, as the new compound is called, may prove more effective than nicotine for the practical control of some injurious insects. Thus far the economic phase of large-scale production of the new insecticide has not been thoroughly gone into, but it is believed that it can be made as cheaply as the manufacture of nicotine.

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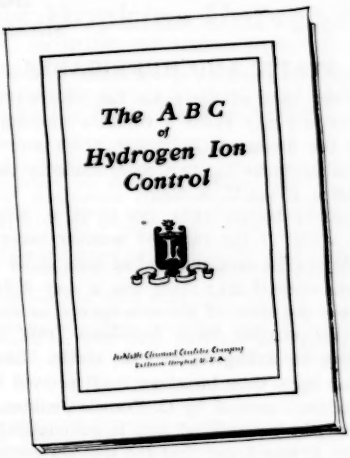

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SCIENCE NEWS

Science Service, Washington, D. C.

STATIC AND HURRICANES

STATIC, the bane of the radio fan who wants to get distant stations, may prove a valuable warning of such storms as the disastrous hurricane which struck Miami last September, according to a study made by the Hydrographic Office of the U. S. Navy.

Beginning in March, 1924, the U. S. S. *Kittery* was used in a study of the value of weather maps in navigation. Before the experiments had been under way very long, it was noticed that there was a very definite relation between the state of the atmosphere, as recorded in the data for weather maps broadcast from the naval radio station at Arlington, and the static. Later, when the weather maps were broadcast and received by means of the machine invented by C. Francis Jenkins, where a duplicate of the transmitted map is automatically drawn on the ship, it was found that the receiver could be used to record static.

The Jenkins machine is used in connection with a radio compass. The latter device is equipped with a loop antenna so that signals may be recorded from one definite direction. As the loop is rotated, and peals of static in any direction are detected by the receiver, corresponding ink lines are drawn on the paper-covered revolving drum of the Jenkins machine. In the time that it takes the recording pen to travel from one end of the drum to the other, the loop is turned through a complete circle, so that the paper gives a graphic picture of the static in any direction from the observer.

The Kittery was fortunate enough, from the scientific viewpoint, to be in the path of the Miami hurricane of September, which was preceded by another hurricane that swept over Bermuda. On September 14, when *The Kittery* was east of Nassau, the Bermuda hurricane was a few hundred miles to the northeast and the Miami hurricane was approaching St. Thomas. The maximum of static was from the direction between these two storms. As the ship sailed south, and the Miami storm came nearer, while the Bermuda one went out of range, the static in the direction of the former became more intense. Finally, on September 16, after *The Kittery* had reached Cape Haitien, at the northwest tip of Haiti, and had made necessary preparations for rough weather, the ship and the storm met. The static was terrific in all directions.

By September 18, when *The Kittery* was at Guantanamo, Cuba, and the storm was 600 miles distant, having crossed the Florida peninsula, there was relatively little static, except in the direction of the storm. Following the low pressure area of the hurricane came one of high pressure and on the morning of September 24, when *The Kittery* was near St. Thomas, no static whatever was recorded, the only time during the entire month that such a condition prevailed. Then, as the vessel started to sail northwest again, towards Cape Hatteras, another disturbance began to develop near Grand Turk Island, and maximum static was recorded in its direction.

Such hurricanes as the Miami one develop in the doldrums of the Atlantic Ocean, off Cape Verde, the western tip of Africa, several weeks before they hit the United States. The Miami hurricane, for example, began about September 5, though it did not reach Florida until September 18. It is suggested that a group of radio compass stations located, perhaps, at San Juan, P. R., a point in the Barbadoes, and Trinidad, would be able to detect these storms as they approach. With three stations, where the lines from each cross would be the center of the storm, so that its position could be accurately plotted and sufficient time for warnings and preparation could be allowed.

The Bureau of Engineering of the Navy Department is now working on a further attachment for the recording device which will record the intensity of the static in each direction, with which, it is expected, still more reliable results may be obtained. An interesting fact learned in the data already obtained, however, with regard to the intensity of the static, is that it is much weaker than signals from powerful transmitting stations.

THE HELIUM SHORTAGE

AMERICA faces a helium shortage. And helium is the unburnable gas that, although undiscovered on earth before 1895, is used to inflate dirigibles and thus keep them from exploding as those filled with hydrogen are likely to do.

The natural gas from the Petrolia, Texas, field which has provided helium up until now is playing out. Since congress has authorized the construction of two giant dirigibles, each 6,000,000 cubic feet capacity, to cost $8,000,000, lack of helium is worrying government officials. The Navy and the U. S. Bureau of Mines are asking congress to appropriate money to pipe to the Fort Worth, Tex., helium extraction plant, built during the war, the helium-bearing natural gas of Nocona, only 25 miles from Petrolia.

The appropriation desired is $500,000 which is needed to construct the necessary pipeline and pressure plant. The bill is now awaiting action by the senate. Once the money is appropriated it will be a matter of only six or seven months before the helium supply can be increased.

The Nocona field was discovered in 1922, but natural gas, although burned in the field, has never been drawn away. The life of the Nocona supply is about 15 years and it will probably produce from 10 to 12 million cubic feet of helium a year during that time.

More helium is essential with the construction of two giant dirigibles in view. There was never enough helium to float the *Los Angeles* and the *Shenandoah* simultaneously. With the destruction of the *Shenandoah* the world's largest single store of pure helium was lost. Each of the projected giant dirigibles will need three times the helium now being used by the dirigible *Los Angeles*.

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X-RAYS AND CROP SEED

X-RAY treatment of seeds, hitherto regarded as invariably harmful in its effects, is now declared beneficial by Dr. M. Jacobson, a plant physiologist, of Camden, N. J., who claims that he has obtained greatly increased yields from seeds subjected to mild doses of "soft" X-rays. The difficulty with the earlier experiments, he states, has been that the rays were used in the harmful "hard" wavelengths, or that the exposure was continued too long.

In one series of experiments which he reports, potted plants grown from rayed seeds grew faster and more vigorously than those grown from unrayed seeds, they flowered and fruited from one to three weeks earlier, and their yield was from 15 to 170 per cent. greater, the fruits being always more numerous and often larger individually.

Seeds were not the only things that benefited by X-ray treatment, Dr. Jacobson says. Potatoes raised from treated tubers gave, in three separate field tests, increases in crops of 35, 107 and 170 per cent. over plantings of untreated tubers. Further tests showed that light has an unfavorable effect on X-rayed tubers and bulbs, which the experimenter states should be protected from the sun after raying if large increases in yield are to be obtained. Time, however, seems to have little effect in diminishing the effect of the raying, for seeds and potato tubers kept for as much as three months after treatment yielded almost as well as did those planted immediately after exposure to the rays.

TYPHUS FEVER IN THE UNITED STATES

IS the louse to be exculpated from its time-honored rôle as the transmitter of typhus fever? The United States is fairly free from this scourge of the old world except where an occasional immigrant brings it in or it creeps across the border from Mexico. Recent epidemics in the southeastern states, however, have aroused considerable concern among epidemiologists.

Dr. Kenneth F. Maxcy, formerly assistant surgeon-general of the U. S. Public Health Service, has completed a survey of carefully collected data on typhus epidemics in Alabama between the years 1922 and 1925 that show that this disease when it shows itself here varies rather strikingly from the form known in Europe.

In the first place, Dr. Maxcy concludes, in only one or two isolated instances could lice, the well-known carriers of typhus in the old world, be considered as the infective agents. The disease seemed to single out native white Americans of respectable station and contrary to precedent did not pick out the poor or the uncleanly. Nearly twice as many men as women were infected and the Negroes were almost entirely immune.

In the second place it reached its maximum in Alabama in the summer and fall whereas typhus has long been associated in Europe with winter and early spring. There were not sharply localized neighborhood outbreaks, continued Dr. Maxcy, but the evidence in hand indicated that people engaged in trade, especially those employed near groceries, feed stores and restaurants, were the classes most often infected. There was comparatively little secondary infections of other members of the same family, but several cases occurred on the same premises at widely separated intervals.

Both from clinical and experimental evidence this disease seems to be identical with old world typhus but is milder and not so often fatal, according to Dr. Maxcy. The louse seems to be excluded as a carrier in America, but it is thought probable that some other agent, such as rats or mice, act as reservoirs of the virus and transmit it to man.

THE FEEDING OF CATTLE

ELECTRIC heaters, fans and a complex system of artificial ventilation help make life endurable for a selected group of shorthorn steers, while scientists study in detail how the fodder they eat is transformed into energy.

At the Nutrition Laboratory maintained at Boston by the Carnegie Institution of Washington, experiments are in progress under the direction of Dr. Francis G. Benedict and Professor Ernest G. Ritzman, of the New Hampshire Agricultural Experiment Station, to find out just how much or how little food cattle need to carry them through the winter. The cattle are confined in a boxed-in stall and everything that goes in and everything that comes out is analyzed and weighed.

The ability of wild animals to adapt themselves to an irregular food supply plus the results of some diet reduction experiments with college students suggested to the investigators the idea that livestock may possess unexpected power to resist undernourishment. It was thought that this adaptability, if true, might be utilized by the farmer in stock-feeding.

Though the results of the experiments are not absolutely conclusive, Dr. Benedict and Professor Ritzman have definitely established that adult steers can be carried through the winter on extraordinarily low rations without affecting their general health or without lessening their power to regain normal weight.

Heretofore, no attempts have been made to measure the energy metabolism of fasting cattle because the huge mass of food that store up in the stomach supplies them with nourishment for days. The studies recently made, say the experimenters, make it clear that both underfeeding and fasting present entirely new problems in nutrition. It is hoped that the facts learned about what happens when an animal converts raw, inert food into living tissue will be of material help in placing feeding standards for livestock on a more dependable basis.

THE CORN BORER

THE United States has officially declared renewed war upon a foreign invader. By authorizing the appropriation of $10,000,000, almost the cost of a first-line armored cruiser, congress has recognized the menace, not of armed men, but of an army of insects, the European corn borers. The stake of the battle is the corn crop, valued at $1,703,430,000 for the past season.

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the corn acreage 90 per cent. Although it is in this country to stay, it has been the hope of government entomologists to keep it confined to states where it will do the least damage and to keep it out of the great corn belt. The borer has been getting nearer and nearer to the corn belt and just recently took its first plunge deep into this sector, appearing in Kankakee County, Illinois.

Annually, the U. S. Bureau of Entomology gets an appropriation from congress for research and quarantine work. Ten million dollars is now asked for an experimental campaign in improved crop methods. It is a clean-up campaign to reduce the chances of spread by reducing the number of borers present in infested areas. The money is wanted at once, for the work must be done by June first. The bill just passed is an authorization bill and must be followed by the actual appropriation of funds. This is unlikely to happen before March, when the last deficiency bill will come up before congress. And so the government, although pledged to war, is stalled for lack of actual funds. The corn borer waits not for any man.

EXPLORATIONS IN CHINA

IGNORING the fighting spirit of the Chinese crowds and their antagonism towards foreigners, Dr. Sven Hedin, the Swedish explorer, is preparing to set out from Peking on a long expedition to the interior deserts of China. Reports just received in this country state that by the end of April Dr. Hedin's caravan of camels will enter the desert from Paoto, the terminal of the Western Chinese Railway.

In the first year of the expedition, the party will study chiefly the climate and geographical features of Mongolia, Chinese Turkestan and the province of Kansu in northwestern China. Weather records will be made from five stations during at least a year and a half, in order to analyze climatic conditions in the large desert belt of Central Asia.

The desolate high plateau of inner Asia, now barren of life, was once a melting pot for people of Greek and Mongolian origin. Dr. Hedin expects to seek out the ruined settlements and strongholds and the ancient graveyards of these ancient races, and hopes to bring out of Chinese Turkestan collections that will shed new light on the history of the human race in this little-known region.

In spite of diplomatic difficulties in China, the Hedin expedition is of an international character. Two prominent Chinese scientists, a geologist and paleontologist, are to join the expedition. The American and English anthropologists at the Peking Union Medical College arranged to cooperate with the expedition in studying the evidences of Stone Age life from the desert region. Young Swedish students of archeology and geology will accompany Dr. Hedin.

This is Dr. Hedin's third venture into the interior of Central Asia. His first expedition, thirty years ago, was daring pioneer adventuring into a country wrapped in mystery and danger. His second expedition, in 1906, led him to the source of the Bramaputra River among mountains far in Tibet. Dr. Hedin is now sixty-one years old.

ITEMS

THYROXIN, the hormone of the thyroid gland, has been made synthetically for the first time in the laboratories of University College, London, according to reports just received by the American Medical Association. Dr. C. R. Harington and Professor George Barger are the workers who have achieved this result from researches supported by funds supplied by the Rockefeller Foundation to the University College Hospital Medical School in 1920. The hormone, which is used in treating patients with a defective thyroid gland, was first isolated by Dr. E. C. Kendall, of the Mayo Clinic, in 1917. Its production synthetically from coal tar products and iodine will assure an absolutely even standard and should have the effect of making the price much lower.

THAT diabetes, heretofore considered a disease of disarranged metabolism, is caused by an ultramicroscopic germ or filterable virus is suggested by experiments on rabbits reported to the American Association for the Advancement of Science by Dr. D. H. Bergey, professor of hygiene and bacteriology of the University of Pennsylvania. By infecting rabbits with carefully filtered secretions from diabetic patients, Dr. Bergey was able to produce the first stages of diabetes in the animals. He also found that the infective agent increases in strength when it is cultured in broth, just as well-known visible germs do. Dr. Bergey called attention to the astounding doubling of the diabetes death rate in the first twenty-three years of this century and declared that since neither bacterial nor protozoal cause for diabetes mellitus had been discovered, this increase "indicated some definite toxic action and suggested the possibility that a filterable virus might be the responsible agent." In testing this idea, Dr. Bergey found that inoculated rabbits developed the diabetic symptoms of sugar in their secretions in one to three weeks and continued to show sugar at irregular intervals, indicating that diabetes had set in.

DOG vaccination for rabies may become compulsory when a standardized vaccine has been achieved. Experiments to determine the efficiency and permanency of canine vaccinations are about to be undertaken in federal, state and New York City laboratories, according to a statement issued by the New York City department of health. Over 100,000 dogs have been vaccinated in Tokio and Yokohama between 1919 and 1924, according to Dr. Hideyo Noguchi, of the Rockefeller Institute for Medical Research. Of these only 41 have subsequently developed rabies. Among one third as many unvaccinated dogs in the same cities there were 16,991 cases of rabies during the same period.

THE ultra-violet radiation in sunshine may be a great help to birds and beasts and man but fish fail to appreciate these invisible rays. Experiments undertaken at a Vermont hatchery, reported to the U. S. Bureau of Fisheries, definitely establish that sunlight is harmful rather than helpful to fish. Almost twice as many young fish died in troughs of water exposed to direct sunlight as those in troughs left in the shade. The experiments were repeated with different ages and different species with sometimes an even greater mortality in the unshaded troughs.

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SCIENCE NEWS

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PSYCHOLOGY APPLIED TO THE AIR SERVICE

DOCTORS and psychologists of the U. S. Air Service are trying to discover what it is that makes fliers fly.

"Every one that wants to fly can't learn," says Major Francis H. Poole, chief of the School of Aviation Medicine now located at Brooks Field at San Antonio, Texas. "Many a man apparently physically and mentally fit and ambitious to become an aviator can never safely leave the ground. Inherent flying ability is hidden below the surface, and the staff of experts here is trying to devise various means of detecting it." The U. S. Army wants flying in the air to be as safe as walking on the ground, and the personality of the pilot is as important as the motion of the motor.

A machine now being built at Washington, D. C., at the U. S. Bureau of Standards under the direction of Dr. L. J. O'Rourke, psychologist, director of Federal Personnel Research, will mechanically probe the mental make-up of prospective fliers and aid in the elimination of those whose reactions make them unfit for the air.

Major Poole points out that Dr. O'Rourke at the request of the Air Service has undertaken the work as part of the extensive program of cooperation of the Personnel Research Division of the United States Civil Service Commission in industrial and personnel research problems involving selection and training.

The speed with which the man examined reacts to signals in color, light and sound, the rapidity with which he makes decisions of what to do in emergencies, the degree of coordination of his movements and other mental characteristics, will be determined by the machine.

The machine is expected to be put to work around March 1, and Captain Neely C. Mashburn, chief psychologist of the school at Brooks Field, says that some such apparatus has been sought for because it is necessary that the verdict on the ability of the prospective flier be uninfluenced by the whims and peculiarities of the examining officer.

Emotional stability, in the opinion of Captain Mashburn, is the most important single characteristic of a good flier. Signs of nervous unbalance often do not show on the surface and no known apparatus or mental test has been able to delve into a man's inner nature and prove whether or not he could stand up under an extreme strain. Even the trick horrors of initiation stunts do not go deep enough.

For this reason, aside from machine-made tests and medical examinations flying students have to undergo, each applicant is now subjected to a searching personality study. The past life of the applicant is as carefully gone over as his eyesight, hearing or heart action. The way in which he is found to have faced emergencies in his past life indicates how he will probably behave in the air in the future. The United States is making rapid advances in the psychological study of its future fliers and the very low mortality in the American flying services is due to this.

In the United States only about a dozen lives were lost during 1926, while in England in only eleven months of that year there were 81 deaths and 51 accidents. There were 230 crashes in the British service where the machines were wrecked beyond repair. "It is my opinion," Major Poole said, "that 90 per cent. of all accidents are due to the pilots and not to the construction of the plane. Machines to-day are almost foolproof, and it is easier to get good mechanics than experts to pick out the men who will not kill themselves."

"EXCITED" ATOMS

A NEW method of chemical decomposition by which "excited" mercury atoms collide with the chemical molecules and split them apart into their constituents just as a bullet from a rifle shatters a clay pigeon, was recently described by Professor Hugh Stott Taylor, chairman of the chemistry department of Princeton University.

This method, which has been developed in the Princeton laboratories by John R. Bates, Charlotte Elizabeth Procter fellow in chemistry, shows that the effect of high temperatures on chemical compounds can be imitated at ordinary room temperatures by introducing into the system mercury atoms endowed by light with high energy.

In this way, water molecules are broken into fragments of hydrogen and oxygen, ammonia into nitrogen and hydrogen, reactions which are generally achieved at high temperatures.

The fragments of the decomposing molecule are very reactive and new combinations can therefore be secured. Thus, when benzol is shattered in the presence of oxygen, phenol or carbolic acid is obtained.

According to Professor Taylor, such a reaction would be of great commercial importance if cheaper methods of producing "excited" atoms could be found. Experiments in this direction are in progress at Princeton as well as the investigation of "excited" atoms of zinc and cadmium.

THE MOUSE PLAGUE IN CALIFORNIA

HALF a million dollars will probably be the loss to farmers from the severe plague of mice in Kern County, Calif., which shows signs of abating. The U. S. Department of Agriculture joined farmers and state workers in conducting a poison campaign. Strychnin poison, laid about the edges of the great alfalfa-planted area where the mice are feasting, is killing them off by millions. At the end of a month the plague should be over, according to Vernon Bailey, of the U. S. Biological Survey, and the farmers of Kern County will be able to start their spring planting with a clean slate—after paying the big board bill that the mice ran up during the plague.

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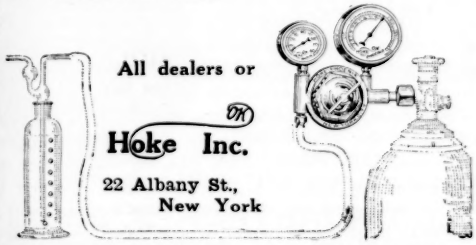

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Field mice present a real agricultural problem. Their appetite is for things important to man such as grass, grains, bark of trees, and even root crops and vegetables. They are almost incessant feeders and, moreover, are prolific and rapid breeders. The total increase from a pair of field mice if all lived and bred would be over 1,000,000 individuals at the end of a year. Thirty-eight states in this country are "mouse states" in which precautions should be taken to prevent such plagues as the one now raging in California. The only states in which mouse plagues may not arise are the states bordering on the Gulf of Mexico, and Tennessee, Kentucky, Arkansas and Oklahoma. As few as ten field mice to the acre on the 65,000,000 acres of hay raised in mouse states would cause a yearly money loss of some $30,000,000 in hay alone. During a mouse plague when the mice are present in much larger numbers the loss is immense.

To minimize the chances of such plagues, Mr. Bailey recommends that the farmers clean up the fields, meadows, borders, roadsides and ditch banks to give the herons, hawks, owls, gulls and other birds of prey a chance to see and catch the mice and thus preserve the necessary degree of control.

The situation in parts of France is so serious that the Pasteur Institute has been experimenting with a disease which kills off the mice in three days. Grain is soaked in a solution containing the bacilli which cause the disease. The mice eat the grain and develop a mortal distemper which they rapidly transfer to each other.

PROTECTION OF THE TEXAS LONGHORN

THE Texas longhorn whose wild head tosses through a thousand romances of the old Southwest, until now threatened with the extinction that nearly overtook the bison and the plains antelope, has joined these animals as a protected ward of the government on a special reservation in the Wichita National Forest in Oklahoma. Though not a native of this continent like its two companions and predecessors of the plains, it was introduced so early by the Spanish settlers and became so wild that it fits into the landscape of the Homeric days of our frontier as completely as they, and naturalists and historians at Washington express themselves as much gratified by the action of Congress in adding this item to the agricultural appropriations bill, which has been signed by the president. Members of the U. S. Forest Service were especially active in promoting the measure, which was cared for at the Capitol by Senator Kendrick, of Wyoming.

The Wichita National Forest and game preserve is an ideal location for these animals. It lies in the heart of the range of the old southern herd of plains buffalo, and is surrounded on all sides by the region formerly known as the Indian Territory where now live more than fifty thousand Indians. Here also grazed the forefathers of these long-horned cattle when the livestock industry of the southwest was in its infancy.

There are still a few living members of this once numerous breed of cattle to be found down in what is known as the prickly pear country of Texas. The herd for the Wichita Forest will be selected with great care by men who are familiar with the characteristics of the old timers of the southwestern ranges. They will be grazed in a pasture immediately adjoining the one occupied by the herd of buffalo now established on the Wichita, and the men who conceived the idea feel sure they will flourish in their new surroundings. Moreover, they claim it will be a profitable investment for the government, for the increase can be sold either for park zoos and other exhibition purposes or else for its beef value. This insures a permanent market for the surplus animals and an excellent financial return on the investment.

MICROSCOPIC PHYSIOLOGY

PROTOPLASM, the stuff that makes things alive, was described by Dr. Robert Chambers, professor of microscopic anatomy at Cornell Medical School, in a recent lecture at the Manhattan Trade School, New York. Rapid advances are being made in our understanding of the chemical and physical foundations of life, the speaker said, and every day the secrets that lie in the living cell are more intimately penetrated.

Protoplasm, as Dr. Chambers described it, shows itself under the microscope to be a clear, colorless material sometimes viscidly fluid like the white of a raw egg, sometimes firm and jelly-like. But whatever its state, it always shows three properties so long as it is not dead: it grows, it moves, it can "feel"—that is, it can respond to stimuli. Nothing that is not alive can do any of these three things.

Although protoplasm is necessarily present wherever life is present, it is divided into such tiny masses, each within a cell wall, that it can not be collected into large quantities for ordinary chemical analysis without killing it, when it would of course no longer be protoplasm at all. It is therefore necessary to carry on all researches on it by means of powerful compound microscopes. Because of this limitation on research into the properties of living matter, scientists could learn nothing at all about it until the microscope was invented, and that occurred only as recently as the seventeenth century. It has therefore come to pass that gross physiology, which deals with the activities of the body in general and can be studied with the naked eye, aided by ordinary chemical and physical apparatus, got a much earlier start than microscopic physiology, which pries into the secrets of the tiny particles of protoplasm themselves. This situation, however, is rapidly being changed, for the science of microscopic physiology, especially during the last half of the nineteenth century and the first quarter of the twentieth which has just ended, has been making great strides to overtake its older companion.

ORION IN THE SOUTHERN SKY

IN the southern evening sky Orion has again become a prominent feature. This constellation is generally considered one of the most magnificent in the heavens, a judgment well warranted by the numerous interesting

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objects that it contains. One of these is the star Betelgeuse. In the old star maps which represented Orion as a giant warrior attacking the bull, Taurus which appears in the neighboring constellation, with an upraised club in his right hand and with a bear skin thrown over his left arm, Betelgeuse was in his right shoulder. The three stars in a row formed his belt, the curved row of stars running from it his sword, and the bright star Rigel his left foot, which was lifted.

But Betelgeuse has scientific as well as mythological interest, for it is one of the largest stars known, and was the first which F. G. Pease, of the Mt. Wilson Observatory, studied when he applied Dr. A. A. Michelson's interferometer to the measurement of stellar diameters. He found that it is about 215 million miles in diameter, or about 250 times the diameter of the sun.

The vast scale of this orb may be better realized when it is recalled that the sun is about 93 million miles away from the earth, so that if the sun were as large as this giant body, we should be inside it!

Another interesting object in Orion is the Great Nebula, which a very keen eye can just glimpse in the sword of the warrior. With even a small telescope, however, it shows up as a sea of light. Unlike the spiral nebulae, which are vast systems of stars, like the Milky Way, but beyond its confines, the Great Nebula of Orion is within the Milky Way, and consists of a cloud of glowing gas. But though not as far as the spirals, it is by no means close, for its light takes about 700 years to reach us, though traveling with a speed great enough to encircle the globe in a seventh of a second! Its diameter is approximately six and a half light years, the light year being about six trillion miles—the distance that light will travel in a year.

Just what keeps it going is unknown, but right at the heart of the nebula is a group of stars which some believe excite the rest of the material to luminescence, just as the cathode rays from the tube recently devised by Dr. Coolidge, of the General Electric Company, cause certain substances to glow, when placed in their path. By means of the spectroscope astronomers have determined what the substances are in the nebula. Most of them are found on earth, but one set of spectral lines corresponds to nothing in the terrestrial laboratory, so astronomers have named it nebulium. Some day it may be found here, just as helium was after it had been discovered on the sun, but its properties are, as yet, unknown.

ITEMS

THE discovery that vitamin A, the physiological preventive of rickets, could be added to food, claimed as original a few days ago by Professor A. Windaus, of Göttingen University, was anticipated by an American scientist by at least two years. In March, 1925, Professor Alfred F. Hess published a notice in the *Journal of Biological Chemistry* of experiments in which he learned that either of two chemical substances, phytosterol and cholesterol, would prevent rickets in animals if they were exposed to ultra-violet radiation and then added to their diet. In the experiments of Professor Windaus, so far as reports received in this country indicate, the same procedure was followed with another compound, ergosterin.

ANTHRAX, the great sheep and cattle plague, may be spread by infected forage. Research recently completed at the Louisiana Experiment Station by Dr. Harry Morris and Harland K. Riley indicates that growing rice, corn, oats and beans are carriers of anthrax spores. Certain sections of the Mississippi delta are known as anthrax districts where frequent outbreaks occur during the summer months and the state investigation was undertaken to clear up one of the little known points in the history of this ancient disease which has in the past attracted the attention of such classical authorities as Koch and Pasteur. How the germ gets from the soil into the body of the animal is a question vital to stock raisers that the investigators have attempted to solve. Their results indicate that anthrax spores can be transferred from contaminated soil to germinating and growing crop plants and thereby facilitate the spread of the disease.

TURN in your old silk stockings or worn-out clothes of that material and have new silk threads made of them. According to experiments recently carried on by Dr. P. P. von Weimarn, of the Imperial Research Institute at Osaka, Japan, this is indeed possible. Dr. Weimarn states that filaments actually better in quality than natural silk can be produced from worn-out silk materials or from the waste silk from cocoons or factories. Threads can be drawn which closely resemble the natural silk in quality. Frequently the threads so spun in these experiments possessed even greater tensile strength than the original threads of natural silk. The other qualities of natural silk, such as elasticity, softness, resistance, satin gloss, were present in the threads so obtained.

IN spite of the usual winter prevalence of children's diseases, mothers of babies less than six months old need not fear, in most cases, that their youngest will catch a disease which an older brother or sister may bring into the house. Infants under six months are as a rule immune to the contagious ills of childhood. This immunity is a birthday gift from their mothers, according to Dr. William H. Park, of the New York City Health Department. A child at birth possesses its mother's immunity. And this immunity stays with the child for about six months. Most mothers are immune to children's diseases. Therefore there are few cases on record of infants under six months contracting the contagious ailments that older children are prey to.

JAZZ is penetrating even into the Orient. American pianos, violins, mandolins and guitars make life merry in the progressive empire of Japan, according to information received by the Department of Commerce. The flowery kingdom is only outstripped by Canada as a purchaser of sheet music and is our third largest buyer of phonograph records. Though the piano has no counterpart among native Japanese instruments it is growing in popularity and musical education is regarded with favor in families of wealth.

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SCIENCE NEWS

Science Service, Washington, D. C.

GREEN LEAVES AND SUNSHINE

We all live on sunlight—men and beasts and all living things in the world. To be sure, it is served up to us as bread and potatoes and cucumbers and onions and other things to eat, but these are mere carriers for the energy of the insubstantial shining rays that were captured and locked up in sugar and starch molecules by the strange green stuff called chlorophyll in the leaves of plants. In a lecture at the Manhattan Trade School Dr. C. Stuart Gager, director of the Brooklyn Botanic Garden, explained the magic of the chemical laboratories in the leaves, which on every sunny summer day take a small fraction of the gases in the air and weave them with water to form food.

The effort of the fabulous philosophers in "Gulliver's Travels" to extract sunshine from cucumbers, Dr. Gager remarked in passing, does not now appear so foolish as it did when Swift wrote his famous satires; there really is sunshine in cucumbers. The cucumber leaves have put it there.

No part of a plant touches human life at so many points, nor so vitally concerns our daily activities as leaves, Dr. Gager remarked. For the food that we eat, whether vegetable or animal; for the clothing we wear, whether cotton, woolen, or silk; for the frame dwellings in which some of us live; and for the wood, coal, gas and electricity by which our buildings are heated and lighted, we are dependent, either directly or indirectly, upon certain vital processes that take place, almost exclusively, within the tissues of green leaves. Sometimes we eat leaves directly, such as lettuce and cabbage, or spinach and other greens; or indirectly, as in the form of bread and potatoes and other vegetables. As every one knows, most of the meat that we eat, as well as our butter and milk, are derived from animals that live wholly or largely on leaves. Every particle of wood and of coal in the world was formerly inside of a green leaf; and the heat and light that give comfort and cheer to our homes represent the sunlight and sun's heat of a previous geological age, captured by green leaves of trees and stored up in their now fossil trunks in our coal mines.

THE COMPOSITION OF MILK

The ancestral strain that unites all the higher animals has been demonstrated through their milk no less than through their blood chemistry. Researches on the lowest of the mammals, just finished at the University of Adelaide by Professor H. R. Marston, have completed the data available on the composition of milk throughout the range of animals that nurse their young on this fluid.

The two chemical compounds most characteristic of all kinds of milk are milk sugar, or lactose, and casein, the latter the proteid substance that forms the basis of cheese. Both these compounds are unique, being found nowhere else in the animal or vegetable kingdoms. Other proteins of milk are likewise distinct but they are not so profoundly different from the proteins of other sources as is casein.

Here is striking evidence of a father and son—or perhaps better, a mother and daughter—relationship among all the hosts of mammals. This is the one thing in common possessed by all the higher animals. As we pass down from man through the apes, dog, tiger, cow, whale, bat, rat and armadillo to the duck-bill, we arrive at an animal that is obviously closely related to the reptiles, for it hatches its young from eggs and has reptile-like jaws.

"The Echidna," says Professor Marston, "transfers the egg to its ventral pouch, which in the breeding season becomes a functional incubatorium, where it very soon hatches, and the embryo obtains its nourishment by nuzzling the milk secreted from the many openings of the mammary duets, which are scattered over the surface of the breast in the region of the pouch. There is no development of a definite teat."

Professor Marston found the milk of the Echidna exceptionally high in fat, 19.6 per cent. being present. Among milks known at present this is equalled only by that of the reindeer and the whale. The monotreme milk had three times the protein content of cow's milk.

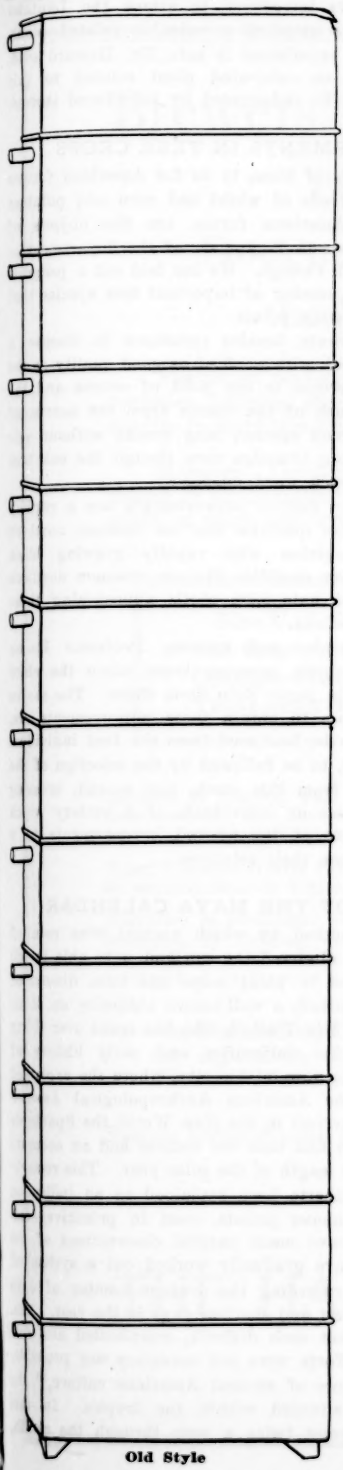
Thus from the simplest mammal to the most exalted we find milk; and this milk always contains lactose and casein, and lactose and casein are found nowhere else. They constitute a continuous thread running up and down through the mammalian world. And they are a strong part of the evidence that mammals evolved one from the other. In the evolving process milk persisted because it proved to be a most desirable means of rearing the young. It needed no improvement, therefore it persisted, even through all the branches and twigs of the great mammalian tree, as it grew and developed from the primitive seedling.

GRASSHOPPERS' PLAGUES

Toasted grasshoppers! Will this delicacy become of necessity the main part of the daily menu of people from southern Argentina to northern Mexico?

For the past four years, tropical migratory grasshoppers have descended in tremendous hordes upon this region, bearing destruction with them to all vegetation in places where they alight. They do their work as thoroughly as enemy invaders that burn the fields behind them. A horde of these grasshoppers will consume practically everything edible in sight in ten minutes. They come in such swarms that they actually obscure the sun for seconds at a time. In addition to their devastating work upon vegetation they often prevent transportation, making the rails dangerously slippery with their body fat.

So serious have been the recent plagues that archeologists are beginning to realize that here lies a possible explanation of the migrations of ancient American civ-



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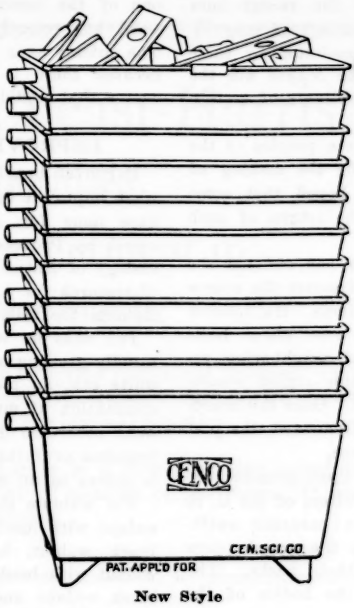

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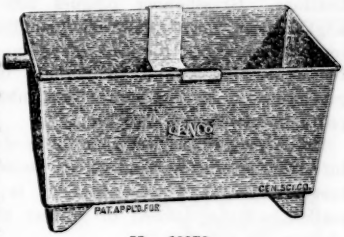

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lizations. Grasshopper plagues like the recent ones might easily have caused the abandonment of magnificent Mayan cities for new places unmolested by these food-consuming pests. Or perhaps the Mayas ate the grasshoppers, as it is known that inhabitants of certain parts of Africa and Asia do.

But before the culinary art of modern peoples of the infested regions is required to include the making of tasty dishes of grasshoppers, it is hoped that some method will be devised to prevent the return of such plagues.

The state of Vera Cruz in Mexico has enlisted the services of Dr. Carlos C. Hoffman to discover the source of these dangerous grasshopper migrations. He believes that they probably originate in the zone about Lake Peten in Guatemala. Cooperation of neighboring republics in further investigation of this region would, Dr. Hoffman feels, be of great benefit. Once the breeding places of these grasshoppers are discovered, the pest could, perhaps, be stopped at its source.

The increase of natural enemies of these grasshoppers is another hopeful sign, says W. R. Walton, of the U. S. Bureau of Entomology. There is a parasitic swift-flying two-winged fly which overtakes the grasshoppers in flight and deposits maggots on their backs. The maggots at once begin eating into the bodies of the grasshoppers. Due to the increase of these parasitic flies a waning in the severity of grasshopper plagues can be expected soon, Mr. Walton says. Another natural check of the pest is found in some beetles native to the infested region which lay their eggs in the grasshopper egg nests. The parasites hatch first and feed upon the grasshopper eggs.

INSECTS IN FIGHT ON CACTUS PEST

Insects are being used, apparently with great success, to save the great livestock ranges of Australia from the ravages of the prickly pear. A report of the sixth year of investigation has recently reached this country and indicates that this extraordinary experiment is about to be crowned with complete success, according to Dr. L. O. Howard, chief of the U. S. Bureau of Entomology.

The beneficial insects are a cochineal or mealy bug, a red spider, a moth larva from South America and another from Texas, and a sucking bug. In many cases the insects have succeeded in reducing the spiny plants to a state of utter collapse.

The fly in the ointment is the presence of a native ladybird beetle, the natural enemy of the cochineal insect. The danger from the ladybird beetle is at this time slight, however, according to E. Mortensen, an American assistant to the Australian Government. The ladybird beetle is feeding upon grass-eating mealy bugs and as yet has shown no interest in the mealy bugs that are being used against the prickly pear. By the time the ladybird beetle turns its attention to these helpful mealy bugs, it is hoped that the danger from the prickly pear will be over.

This is only the second experiment of the kind ever tried. The first one was carried on in Hawaii against the Lantana weed. It was not a complete success, since one of the insects introduced to attack the Lantana weed has recently attacked a valuable related plant. The prickly pear experiment is safe, Dr. Howard said, because there is no cultivated plant related to this cactus that would be endangered by introduced insects.

IMPROVEMENTS IN TREE CROPS

Improved breeds of trees, to do for American forests what improved breeds of wheat and corn and potatoes have done for American farms, are the objects of search by Professor O. L. Inman, of the department of biology of Antioch College. He has laid out a program of research for a number of important tree species that includes the following points:

For oaks he wants, besides resistance to disease, a rapidly growing oak with wood of as good quality as the white oak, an increase in the yield of acorns and the elimination of much of the tannin from the acorns of some otherwise good species, long trunks without side branches or forking branches even though the oak tree is grown in an open wood lot.

For walnuts the desired improvements are a rapidly walnut with lumber qualities like our common northern black walnut, together with rapidly growing black walnut with lumber qualities like our common northern black walnut and nuts with shells approaching those of the English walnut.

For aspens, poplar and spruces, Professor Inman chiefly desires rapidly growing trees, since the chief object is to obtain paper pulp from these. The means by which he hopes to obtain these improvements are, first, selection of the best seed from the best individual trees of a species, to be followed by the selection of the seedlings grown from this stock, and second, crossing varieties or species or individuals of a variety which show one or more of the desired improvements to a greater degree than their relatives.

ORIGIN OF THE MAYA CALENDAR

The simple method by which ancient wise men of tropical America observed the sun and were able to tell their people when to plant crops has been discovered by Mrs. Zelia Nuttall, a well-known authority on Mexican archeology. Mrs. Nuttall, who has spent over thirty years studying the antiquities and early history of ancient Mexico, is now in this city, where she explained her theory to the American Anthropological Association. On their arrival in the New World the Spaniards were surprised to find that the natives had an accurate knowledge of the length of the solar year. This remarkable fact has hitherto been explained as an indication that early astronomer priests, even in primitive communities, must have made careful observations of the sun and must have gradually worked out a system of calculating and recording the average number of days between the longest and shortest days in the year. Mrs. Nuttall found that such difficult, complicated and sustained mental efforts were not necessary nor probable.

"All the centers of ancient American culture," she explains, "are situated within the tropics. In this zone the sun passes twice a year through the zenith,

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the result being that twice a year at noon there occurred the momentary striking phenomenon of all vertical objects casting no shadow.

"Archeological and documentary evidence establish beyond doubt that the Mexican, Maya, Peruvians, Ecuadorians and others inhabiting the tropical zone observed the periodical strange and momentary disappearance of shadows and interpreted it as 'a descent of the Sun-God.'

"This 'descent of the god' was of outstanding importance to the primitive farmers, because it was always accompanied by rains, caused by the heat of the vertical solar rays. The priests or wise men who observed the 'descent of the god' could thus safely assure the people that the time was ready for them to sow the seeds of maize and other food plants."

The first means by which the solar phenomenon could have been noted were plain vertical posts or upright stones. But later, Mrs. Nuttall believes, the people began to feel that more worthy places of rest should be provided for the descending Sun-God. Sun-pillars, stelae, stone seats, altars, towers, and even shrines and temples were set up to celebrate this great and mysterious phenomenon, and in time an elaborate ceremonial was developed, which included the offering of blood and sacrifice of human victims.

In the light of this discovery, ancient American religions, art and calendars take on new aspects. The Sun-God, who is so widely depicted in the Mexican Codices and bas-reliefs and on Maya temples with his heels in the air and his head far below them, has generally been termed "the diving god." According to Mrs. Nuttall's interpretation of these figures, the god is descending through the air and the feather-like decorations on his arms are symbolical like the wings with which angels are represented in Christian art. Many of the carved and painted representations of the Sun-God in the form of a human being, bird or jaguar, show him accompanied by plumed serpents which symbolize the rains from heaven associated with him.

HEALTH SURVEYS BY THE MILBANK MEMORIAL FUND

THE directors of the Milbank Memorial Fund of New York have set out deliberately to increase the life span of the residents in three typical districts of New York state. They have determined to enlist the cooperation of the best professional experts and to make demonstrations of what can now be done to reduce sickness and to extend the period of healthy life in the average American community.

Work has been under way for more than three years in Cattaraugus County and in Syracuse, two of the centers selected for the New York health demonstration. One of these districts is typically rural; the other a medium-sized city.

Inauguration of the third enterprise in the Bellevue and Yorkville neighborhoods of New York City was announced about a year ago. This district is bounded by Fourteenth and Sixty-fourth Streets, the East River and Fourth Avenue. From Forty-second to Fifty-ninth Streets it extends as far west as Sixth Avenue. This means that it has within it the large slice of fashionable New York that centers around Park Avenue and the fifties, as well as some very poor districts, and some that are peopled by the merely comfortable social groups. Its population is 214,000.

Each of the experiments is conducted under the auspices of the local health officers, and in accordance with the laws and rules and regulations of the New York State Health Department, and of each locality. What the fund does is to afford expert consultants, and temporarily to provide the money for services which would otherwise not be obtainable in the locality.

That American citizens will themselves pay bills shown necessary to maintain improved public health standards has already been demonstrated, in part, in Cattaraugus County and in Syracuse. In the latter city, the Board of Estimate just recently voted to take over $51,970.00 for additional health services set up and temporarily provided through these demonstrations. In the former locality, Cattaraugus County, the Board of Supervisors agreed to take over $56,000 of such expenditures for public health work, increasing by 250 per cent. any previous appropriation of public funds for this purpose.

The results of this longer life campaign in these three typical districts will be watched with interest by members of medical and lay professions alike.

ITEMS

AN earthquake that shook the Pacific Ocean near the Kurile Islands at 8:35 p. m. Eastern Standard Time, on Tuesday, February 15, was entirely separate from the devastating shocks that wrought so much damage in the Balkans, said Commander N. H. Heck in charge of the earthquake investigations of the U. S. Coast and Geodetic Survey here. After studying reports from seismograph stations gathered by Science Service, he stated that the location of the epicenter, or point of greatest motion of the quake, was at latitude 46 degrees North and longitude 154 degrees East, at a point in a great ocean trough about 200 miles south of Kamchatka. "This earthquake and the ones in the Balkans afford an interesting comparison. The one on the Pacific Ocean was felt throughout the world on seismographs yet did no damage, while the Balkan quakes were not severe enough to give more than a faint record on American seismographs. The Balkan earthquakes were very localized, yet they happened to coincide with a well-settled region, and so much damage was done."

EVIDENCE that protection of birds has progressed much further in the United States than in Japan is furnished by a report recently received at Washington, D. C., which states in the latter country commercial hunters are butchering song birds wholesale to offer in the food markets. Because of their almost direct north-and-south distribution, the islands of the Japanese archipelago form a favorite migration route for thousands of small birds, and the traveling flocks have been waylaid with lures and nets.

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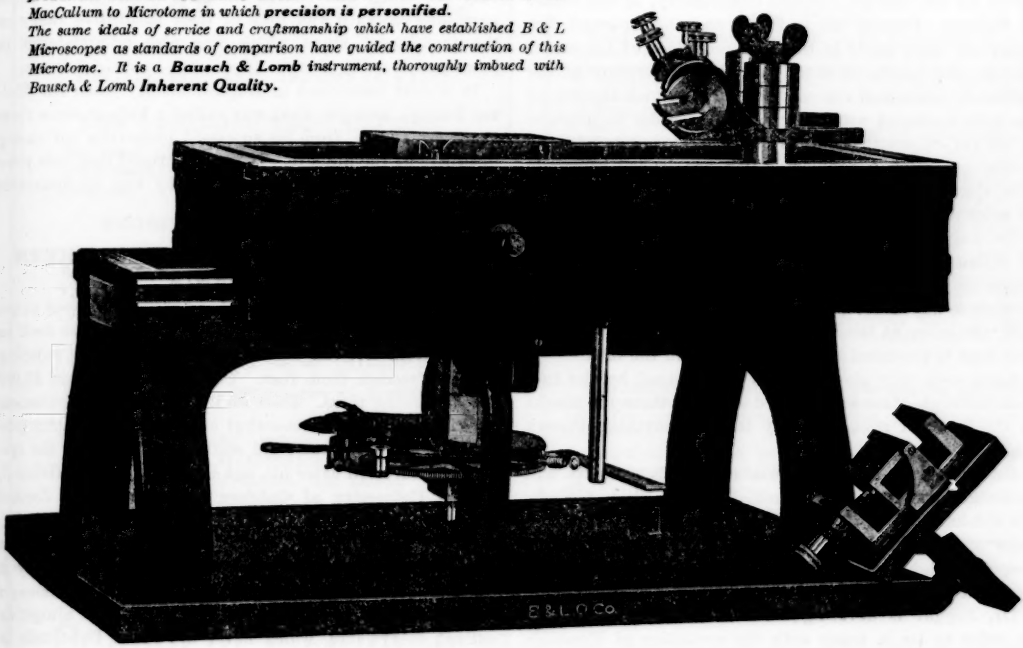

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SCIENCE NEWS

Science Service, Washington, D. C.

THE HEAT OF KILAUEA

A NEW method of ascertaining the temperature of volcanic fires is being undertaken by Dr. T. A. Jaggar, director of the Hawaii Volcano Observatory, in the crater of Kilauea. Borings ten feet deep and one thousand feet apart are being made in the solid rock floor of the crater and as each boring is completed, the temperature at the bottom is taken and recorded, following which the top of the hole is capped with a metal ring in order to preserve it for future readings. It is expected by means of these borings to solve a problem which has baffled scientists ever since their attention was first directed to a study of volcanoes and earthquakes.

Dr. Jaggar has three objects in boring into the crater of Kilauea: He wishes to ascertain the relation of increase in temperature to increase in depth, to discover if there is any difference between the temperatures in the different holes at the same depth and to see to what extent heat is produced by slow oxidation in the lava.

Lava cools very slowly. This is evidenced by the fact that although Mauna Iki flowed in 1920, there are cracks in the lava hot enough to-day to burn anything thrown into them.

Dr. Jaggar is as yet uncertain just what results will be worked out from data obtained through these borings. He thinks it quite possible that some of the holes may show a seasonal or tidal heating or cooling. Volcanic eruption might even be forecast by the sudden rise in temperature in these holes.

Dr. Jaggar is devoting his life to volcanic research. In order to be in touch with the activities of Hawaii's volcano day and night, he has established his home almost directly on the edge of its crater where he can watch its constantly varying moods through the seismographic instruments, as well as by personal observation of its interior.

CHINESE JADE

SOPHISTICATED jade earrings that are a necessary decoration of sleek evening coiffures are a modern symptom of the jade madness that has possessed China for centuries. The taste for the green quartz of Asia has become so keen that a celebrated firm in London recently started working its own jade quarry in Burma.

Though its home is in northern Burma and Turkestan jade is called Chinese because the grinding and carving is all done in China. The Chinese are the only masters of this industry because jade has always been esteemed by them as the "quintessence of heaven and earth," the most precious of precious stones.

The earliest use of jade was almost purely ritualistic and symbolical, according to R. L. Hobson, curator of the department of ceramics and ethnography at the British Museum. It was a royal stone and kings were wont to exchange cities or towns for a single piece. It was one of the oldest commodities of trade and for this reason the best has never been exported but is reserved for the trade in China itself.

Many of the finest pieces have been taken from tombs while the badges of princes of royal blood were always jade. Gold was the material used for those of officers of only the third and fourth rank. The artists of China have long lavished full play of their decorative fancy on the translucent stone which was also administered in powdered form by Chinese physicians to their patients.

It is first mentioned in English history when Sir Walter Raleigh brought what was called a kidney stone from the West Indies, from its supposed properties for curing disorders of the kidneys. It is conjectured that this piece of jade reached the Western world by way of Spaniards who probably had it from the East.

BAND-TAILED PIGEONS IN SOUTHERN CALIFORNIA

THOUSANDS of pigeons that have recently flocked to the San Fernando Valley in Southern California to feed on acorns from live-oak trees in the canyons are enjoying perfect freedom from fear. There is a penalty of $5,000 for disturbing them. Their slate-blue color and iridescent neck, an appearance somewhat similar to the extinct passenger pigeon, led some old settlers to hope that the species had survived after all, but Professor Joseph Grinnell, of the University of California, has definitely decided otherwise.

"There is, of course, not the faintest doubt that the wild pigeon reported from the San Fernando Valley is the band-tailed pigeon," he says. "The true passenger pigeon was an entirely different species, now altogether extinct everywhere, which never did reach California as far as evidence and testimony show."

The presence of the band-tailed pigeon in numbers is almost as interesting as if the species had indeed been the passenger pigeon, says Professor Grinnell, who was instrumental in rescuing this second threatened species from extermination a few years ago. The birds were being mercilessly slaughtered and at the rate they were then going would not have lasted five years. Only one young is produced a year, the slowest propagation among game birds, and with one hunter alone shipping at one time 2,000 birds to market there would have been no chance for the species unless there was immediate legislation.

Fortunately Professor Grinnell's plea was heard, and he now reports that the band-tailed pigeon is again prevalent in practically its original range.

THE INFLUENZA EPIDEMIC IN EUROPE

WORD of what may be an important step toward the solution of the influenza problem has just been received at the surgeon-general's office of the U. S. Public Health Service from Dr. Ludwih Rajchman, medical director of the health section of the League of Nations.

Health authorities all over Europe have been asked to work on the preparation of a report for the League of Nations on the course of the present epidemic in each country, just as soon as the epidemic has subsided to the

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point where such research is practicable. It is hoped that by the prompt tabulation of this information the medical world will have some useful data to use in putting up defenses against the next epidemic.

The health officials will have their hands full checking up on all the details that are wanted concerning the intangible enemy. It is particularly desirable to know the geographical distribution of the disease, the time order in which it appeared in different districts, and the movement of contagion from week to week. Description of the clinical types of the disease at different periods and the kind and frequency of complications as well as the ages of the fatal cases are other points on which information is desired. Last, but far from least, will be a comparison of the bacteriological findings from cases in the different countries and the measures that the health officials have found the most successful in controlling the disease.

In spite of the vast amount of bacteriological work that has been done on the subject, medical science is still in the dark as to the cause of influenza. The complications like bronchitis and pneumonia that frequently follow have rendered the isolation of the germ causing primary influenza particularly difficult. The various vaccines that have been tried out have met with almost as much failure as success. Leaders in the medical profession admit that should a visitation of influenza assume the proportions and virulence of 1918, we should be as impotent to deal with it as we were then.

What Europe has learned that is new from her recent experiences with this much-dreaded disease will be made available to the rest of the world with the publication of this report. In the meantime it is well to remember that the best preventive measure where influenza is concerned, that we now know, is to keep in the best possible physical condition and to stay out of crowds whenever an epidemic is prevalent.

A PROPOSED DIKE FOR NEW JERSEY

THE peaceful, benevolent, milk-giving Jersey cow will replace the vicious, malicious, blood-sucking New Jersey mosquito in the now largely useless "mosquito country," according to William T. Donnelly, New York engineer, who addressed the New Jersey Mosquito Extermination Association at its annual meeting. Engineering, declared Mr. Donnelly, can turn the trick, and make rich agricultural land out of all the marshy territory that now breeds only biting pests.

He proposes to turn the edge of New Jersey into a sort of American Holland. The marshy strip is wet and pestiferous now mainly because of the periodic invasion of the highest sea tides, and if these could be stopped by a great dike sweeping along the whole coast, with suitable cross dikes running back from it to subdivide the land, the impounded country could be cleared of its water at relatively small expense. The mosquito pools would then disappear, and the now semi-inundated land, which is naturally very rich, would become a garden and dairy region to supply the great industrial cities that lie in a ring around New Jersey.

The main dike which he proposes could be constructed in such a way as to serve a triple end. It could be thrown up by means of a giant dredge, which would work along in a channel of its own making on the landward side of the embankment. The top of the dike could serve as a highroad for motor transport, and the channel could be given permanent form as a canal for slower and cheaper water-borne traffic.

The cost of the undertaking need not be prohibitive, he claimed, pointing to the examples of Egypt, China and Holland, who have succeeded in similar works with much more primitive means than are at the command of present-day engineering.

THE WAGES OF PRISONERS

CONVICTS in American prisons should be paid a living wage for their work, such as they could earn in the outside world; and their financial affairs should be so directed that they would leave prison with a better understanding of how to live on a working man's wages and how to apportion their money sensibly.

This solution of the nation-wide problem of payment of prison labor is suggested by Dr. Charles S. Hyneman, of Indiana University, reported in the forthcoming issue of the *Journal of Criminal Law and Criminology*.

Dr. Hyneman advocates giving prisoners an incentive to work by paying each one according to the quality and quantity of the work he turns out. The state, he says, should deduct from the wage an arbitrary amount intended to very nearly equal the living costs of the average free laborer engaged in the same occupation as the prisoner. The prisoner should then be given a certain part of his earnings as spending money. And of the remainder of his wages, he should be compelled to contribute to the support of his dependents. If any money is left, it would be saved for the prisoner's own use after he has been released. This scheme will increase production in our prison workshops more than enough to offset the amount paid in wages.

The laws in different states providing payment for prison work vary widely. Thirteen states pay no wage whatever. Some pay four or five cents a day. In a few cases it is possible for a convict occasionally to earn as much as $45 a month.

"By refusing to pay a money wage to the prisoner, society has made it impossible for him to accumulate a fund to support himself after his release from prison while he fits himself into the working and earning world. In so doing the state has not merely increased the obstacles in the way of the convict who is determined to go right, but has forced many of them to return to the paths which first landed them behind the bars."

Dr. Hyneman opposes the plan of paying a prisoner according to the number of his dependents or according to his willingness to work. If the prisoner is taught during his incarceration to expect as much as other prisoners, even though he is disabled in some way or is unable to do a standard amount of work, when he is freed he will be discontented if he finds himself unable to make as much as other stronger men in the industrial field. "He

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must go out of the prison in a state of mind which will insure as much as possible his contentment with the working and wage conditions which he will meet in the outside world," this sociologist states. "The prison must be made to a large extent an industrial training school."

THE CHINESE DEATH RATE

CHINA, with its swarming millions of people, is crowded streets and villages, has a very low rate of population increase in recent years, largely because of the great proportion of deaths. This fact is shown by a new study of Chinese censuses since 1741, made by a Chinese government statistician, Chang-heng Chen.

In 1741, the Chinese people numbered only about 25 millions more than the United States population of to-day, and in the 50 years following 1741 the population more than doubled, advancing at the rate of 15 per 1,000 people every year. In the next half century, the population increase slowed down to less than five additions a year to each 1,000 people. From 1849 down to 1923, the rate of addition has gone down to only .81 per thousand. This, Mr. Chang says, is lower than the rate of population advance in any other country except France.

"The rate of increase of nations of the white race since 1800 has been 11 per 1,000," he says. "This means that the rate of increase of the Chinese population in modern times has been not quite one third as fast as that of other countries."

The Chinese population reached the 400,000,000 mark back in 1835, according to the census figures. Since that time it has advanced only to 438,370,000, and the statistician believes that this extraordinarily slow rate of advance is due to high death rates rather than to low birth rates. China does not need any large increase of population at present, he adds, but high death rates are not healthy factors.

Census figures before 1741 in China were misleading because the head count included only males between 16 and 60 years and it was taken with the primary purpose of leveling taxes. These taxes were lower in sparsely settled communities. Hence, Chinese population figures were often strangely low. After 1741, both males and females of all ages were counted.

ITEMS

BULGARIA and Japan are now being overrun with waves from the influenza epidemic spreading over Europe and Asia, according to the latest cable received by the U. S. Public Health Service from the Health Section of the League of Nations. The increase is marked in the latter country but in London the epidemic has begun to subside. The mild form that has characterized the disease all along prevails and it is still pursuing a moderate course in Czecho-Slovakia, Hungary and Portugal, according to information issued from the surgeon-general's office. In Switzerland, where the epidemic has reached considerable proportions, the disease appears to be particularly contagious, the Geneva correspondent of the American Medical Association reports. The public schools have been closed and strict isolation of all cases has been ordered. At Basle auxiliary hospitals have been opened up to take care of the overflow from the city hospitals. Fortunately all of the cases have been of a relatively mild character.

THE methods by which the modern scientist can make sound waves appear before him and reveal their secrets was described by Carl E. Seashore, of the University of Iowa. Dr. Seashore, who addressed psychologists of the American Association for the Advancement of Science, said that photographic records of the sound waves that make up a song are far more faithful in detail than the message that the song carries even to the most musical ear. A visible record of a negro "blues" song as sung in a cornfield was exhibited and also an Indian song. Showing how these marks in black and white reveal much more definite information as to the pitch, vibrato and other qualities of the singer's voice than phonograph records can record, Dr. Seashore said that no collector of primitive music can now afford to collect with the phonograph alone. The factors that make music beautiful and appealing are being particularly studied by Dr. Seashore and others working at the psychological laboratory. The quivering vibrato is now recognized as being an important means of portraying emotion in music and in speech. Evidences of vibrato were found in 93 per cent. of the voices of well-trained and moderately-trained singers whose voices were photographed. This quality was also evident in 27 per cent. of the untrained adults. Another series of tests showed that vibrato is prevalent in ordinary speech when voices become emotional.

CHINA, with its swarming millions of people, its crowded growing pains as a result of renewed contact with Occidental ways of doing things, has had experiences of this kind before, stretching far back into the dawn of history, recent researches by German and Scandinavian archeologists in the Celestial Kingdom indicate. One expedition into the interior of China has found considerable numbers of beautifully worked pottery objects, mingled with stone weapons and tools, all dating back to about 3,000 B. C. Their pattern and workmanship is strongly suggestive of similar articles of New Stone Age date from eastern Russia and from the Persia-Mesopotamia region, which indicates an influx of western culture into China as far back as the end of neolithic times. There seems to have been no definite Bronze Age in China, or if there was one it was relatively brief, the finds indicate; for rough implements of iron are found in remains of about 2,000 B. C., a date apparently as remote as the earliest objects of copper and bronze in China.

CENSUS returns, just published, show that of the 40,730,000 total population of France, 2,500,000 are foreigners. In the department of the Seine which takes in all of Paris, the foreign proportion runs as high as 10 per cent. Economists, worried over the influx, insist that immigration should be limited and the artificial condition of the monetary exchange corrected without delay. In the future all applicants for naturalization in the department of the Seine will, according to a new regulation, have to submit to a medical examination.

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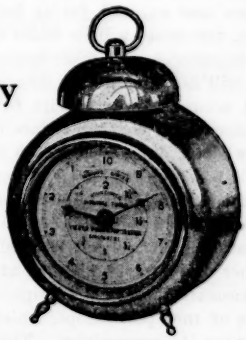

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SCIENCE NEWS

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THE PONS-WINNECKE COMET

FOR the first time in a number of years a comet will be visible in the night sky a few months from now. The Pons-Winnecke comet, discovered at the Yerkes Observatory on March 3, will be less than four million miles away from the earth on June 26, according to a report to Science Service from Professor George Van Biesbroeck, discoverer of the comet. At that time it will be visible to the unaided eye. It will then be in the constellation of Aquarius, in the southeastern sky about midnight, and directly south about 3:00 A. M. Not far from it will be the bright star Altair, in the constellation of Aquila, the eagle, which can now be seen low in the eastern sky just before sunrise. At present, the comet is in the constellation of Bootes, near the bright star Arcturus, which is now in the southern sky in the early morning hours.

Though the Yerkes Observatory has in its equipment the largest refracting telescope in the world, with a lens forty inches in diameter, the comet was discovered with a much more modest instrument. This is a reflector, in which a concave mirror replaces the convex lens of the refractor, with a mirror only twenty-four inches in diameter. With the greater light-grasping powers of the reflector, however, it is possible to photograph fainter objects with the smaller instrument than can be seen with the big one. The comet was found on photographs made with the reflector, and appeared as a tiny round patch of nebulosity of the sixteenth magnitude. The human eye can not see objects fainter than about the fifth magnitude.

From now on, and for as long as it continues to be visible, the comet will be under the scrutiny of Professor Van Biesbroeck and other astronomers. These observations will be intended to determine the position of the comet accurately so that its future wanderings may be more accurately charted. Since it was here last, six years ago, when it did not approach nearly as close as it will now, it has been subjected to perturbations by the gravitational attraction of Jupiter and other bodies, which are very difficult to compute, and so its exact position on its present return could not be predicted precisely.

Other observations planned at the Yerkes Observatory will measure the comet's brightness, and still others, by means of the spectroscope, which analyzes its light, will determine its composition. The tail, which will appear as the comet approaches nearer the sun, is known to consist largely of carbon monoxide, a deadly gas frequently produced on earth as a product of incomplete combustion of coal or other fuel.

FOSSIL FOOTPRINTS IN THE GRAND CANYON

NEW finds of fossil footprints of extinct animals, indelibly printed on slabs of solid stone, have recently been brought to Washington by G. F. Sturdevant, ranger naturalist of Grand Canyon National Park, and deposited with Dr. Charles W. Gilmore at the U. S. National Museum. One of the specimens is of a greater age than any hitherto discovered at the Grand Canyon, belonging to the Cambrian age, before any four-footed backboned animals had appeared on earth. The tracks are small, sharp prickings in the sandstone, with no trace of toes, and between them trails a sinuous double furrow, as though some part of the animal's body had dragged through the sandy mud. It is probable that the creature that made them belonged to the zoological group now represented by crayfishes, scorpions and insects. The age in years of these tracks is so great that it remains largely a matter of conjecture; thirty-five million years have been suggested as a conservative estimate.

The second slab is only about half as old, belonging to the Pennsylvanian or upper coal-age level. The tracks on this are of an animal with well-developed toes, probably of the group represented by the modern frogs and salamanders. Though distinct from other tracks previously reported from the Grand Canyon, they bear a sort of family resemblance to them.

Dr. Gilmore states that he intends to spend some time at the Grand Canyon during the spring and summer investigating these tracks and seeking for new material.

THE GREAT ELK HERD

THE great elk herd of Jackson Hole, south of Yellowstone National Park, is to receive the benefit of a new program of scientific game management as the outcome of the organization of a commission on the administration and conservation of the elk.

Represented on this commission, whose first session has just closed, are the U. S. National Park Service, the U. S. Forest Service, the U. S. Biological Survey, the General Land Office, the State of Wyoming, a number of outdoor life organizations, and ranching and business interests of the Jackson Hole district. In their discussion they endeavored to bring out all information now available concerning the numbers and state of health of the elk, their pasturage and other feed supplies, their relation to the cattle-raising and other industries of the region, and to lay out the beginnings of a policy for the future handling of the vast game herds.

The present number of elk is estimated as about 20,000 in the Jackson Hole district, which is matched by about the same number in Yellowstone Park itself, the so-called "northern herd." The question of the future of this northern herd was not taken up at the present meeting, but reserved for a future session.

The problems presented by the elk herds differ from those set a generation ago by the bison, because then the question was one of saving a vanishing species, whereas now the difficulty is that the elk are multiplying much more rapidly than their present range will comfortably allow. The present number, 20,000, seems to be the maximum that the range will support, and in severe winters when feed runs short they die by thousands from starvation. The last bad year was the winter of 1919-1920, when fully half the herd perished. But since new

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calves tend to add about 25 per cent. to the herd's total number each year, by 1924 the number was up to normal again.

Partially to offset the failure of natural feed, and to decrease the sufferings of the herd in bad winters, various governmental and private agencies raise hay in large quantities. In mild winters this is allowed to accumulate, and when, at intervals of six or seven years, a season of starvation weather ensues, this is distributed by the rangers. In such winters, each elk requires from a third to a half ton of hay during a period of ninety days.

The consensus of opinion of the conference was that the herd should be held to a top limit of 20,000 animals, that appropriate means be sought to dispose of any surplus, and that certain "key" lands now operated as private ranches in the elk country should be purchased and deeded back to the United States.

WASTES IN COTTON, CORN AND PEANUTS

How to put corn stalks, peanut shells and cotton stalks to use is the problem that engineers of the U. S. Bureau of Standards are about to tackle. Congress has appropriated $50,000, available July 1, for an investigation looking toward the utilization of waste products from the growing of corn, peanuts and cotton.

Scientists recall that at one time the seeds of cotton were considered valueless and that now they form the raw material for a vast industry. The grains of corn, except for the relatively small part of the leaves and stalk used for fodder, constitute the only usable part of America's great corn crop, and since the grain represents only about a fifth of the total weight of the corn plant, experts see the possibility of using the stalks and cobs. Various methods of harvesting, collecting and bringing together enough stalks to make utilization possible are being considered. Manufacture of paper, alcohol and other chemical products from the stalks are being considered. A similar problem is presented by the peanut hulls which now constitute a waste by-product of large magnitude.

Warren E. Emley, Bureau of Standards engineer, is now making a survey of the problems and expects to receive suggestions and descriptions of various possible utilizations from those who have ideas upon the problem. He will shortly make a trip into the corn belt states where some experimental work has already been started.

PARAFFIN PROTECTION AGAINST SHIP-WORMS

BLOCKS of wood given a special paraffin treatment have stayed under water along the Atlantic coast for almost two years without being attacked by the ferocious shipworms that swarm in these waters, according to findings made by the Chemical Warfare Service.

The paraffin treatment under test was devised and patented several years ago by Dr. Paul Bartsch, marine biologist of the U. S. National Museum. After recent examination, the protected blocks were replaced in the water so that the endurance contest between the wood and the worms may continue.

Dr. Bartsch's discovery has attracted considerable attention, because of the enormous damage to wooden wharves, ships and houses caused by shipworms, ants, bacteria and fungus plants. The process consists in penetrating all the tissue of the wood with melted paraffin and two kinds of paraffin soluble poisons. Two poisons are used, Dr. Bartsch explains, because suitable chemicals which are deadly to animals fail to destroy plant life, and *vice versa*.

Whether the paraffin armor protects wood indefinitely against land armies is being tested at the Biological Station in Barro Colorado Island in the Canal Zone. Blocks of wood treated with the paraffin process have been kept buried in a white ant cemetery since February, 1924. When the blocks were last dug up temporarily for examination by a biologist at the station, he reported that the wood was still keeping the ants at bay after two and a half years, and no sign of dry rot or decay of the wood had taken place.

MEMORY TESTS ON SQUIRRELS

Do squirrels remember where they hide nuts? Or can they smell a nut hidden in the ground? Or do they sometimes just dig around and find something by chance, because so many squirrels have buried so many nuts in the squirrel neighborhood?

This squirrel puzzle is a live topic among naturalists. The story of a red squirrel that buried nine nuts in the snow on a house balcony, and that came next day and carefully dug up the nine nuts, one by one, even though a new fall of snow complicated the problem, is told by Dr. A. Brookes Klugh, of Cornell University, in a report to the forthcoming issue of *The Journal of Mammalogy*. This incident, Dr. Klugh says, is proof of the red squirrel's remarkably strong memory for location. In many cases, there is a possibility that the sense of smell may help a squirrel to find hidden objects, he adds, but this time such assistance seems out of the question.

Dr. Klugh has studied red squirrels for eight years, and has watched individual squirrels over periods as long as two years. He says: "Time after time, I have seen a squirrel go by the nearest route to something it has stored, take it out, and eat it."

Observations indicating that squirrels do not "smell out" buried nuts have been made by L. R. Dice, of the University of Michigan, and described in the same journal. A fox squirrel, which came regularly to be fed, was observed over a period of several months. The squirrel was fed in a shallow box on the house porch, and Mr. Dice filled it with sand and buried a number of nuts under the sand. The squirrel came frequently to the box to eat nuts which were left for it on top of the sand. It sometimes dug around in the sand and if a nut were partially buried with one end sticking up in sight, the squirrel would be likely to find it. But it never discovered a single completely buried nut. If no walnuts were in sight, it would hunt about, and leave without its dinner.

"If squirrels do not find buried nuts by use of the sense of smell," he states, "the presumption would be that they remember the place where they have buried each

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nut that they find. This would require a well-developed memory, though not necessarily a perfect memory, for squirrels undoubtedly fail to find many nuts they have buried."

GASOLINE AND FIRE WORSHIP

THE Baku region, the magnet that is drawing the oil interests into the East, was the center of the fire worship of the ancient Magi.

In a history of fire as an agent in human culture just issued, Dr. Walter Hough, head curator of anthropology in the U. S. National Museum, points out that a Parsee fire temple near Baku made the first recorded use of natural gas about the beginning of the seventh century. According to one account, the gas well was ignited by accident and continued to burn in the shrine that was built over it for over a thousand years.

The discovery of petroleum in North America during the nineteenth century, Dr. Hough points out, probably saved the whale from extinction since it put an end to the great whaling industry which had developed out of the use of sea-oil lamps. A unique torch used by the natives of the Orkney Islands utilizes the body of the stormy petrel for illumination. The sea-bird's body is so impregnated with oil that it makes a good light. The burning is sometimes facilitated by the insertion of a wick, thus making a true lamp.

The first people to use coal for fuel, according to Dr. Hough, were the Pueblo Indians of Arizona. It was dug out of near-by veins for firing pottery, but as far as can be ascertained was used only for this purpose. This sporadic use of coal antedated by many centuries its employment for fuel by civilized man.

Roman houses were heated by a kind of hot-air furnace system of pipes that conducted heated air through the rooms from a subterranean furnace. During the supremacy of Rome, also, olive oil formed the basis of one of the greatest developments in the history of illumination, declares Dr. Hough. The use of the oil-burning Roman lamp extended throughout the regions bordering on the Mediterranean, dating from the time when the empire became developed sufficiently along economic lines to have an excess of oil over what was needed for food.

ITEMS

RHENIUM, the chemical element whose discovery was recently announced by Drs. Walter and Ida Noddack, has now been obtained in pure form. The first discovery was based on the finding of the characteristic lines in the X-ray spectrum as detected by photographic plates, but now the Noddacks have succeeded in obtaining, after long and difficult refining processes, a small quantity of the substance itself. They describe it as a black powder of high melting-point that unites readily with a number of other elements. In an atmosphere of pure oxygen it ignites, forming a white oxide. The quantity so far obtained is very minute, only two milligrams, or seven one hundred thousandths of an ounce, and the experimenters are now at work to elaborate more of it which will permit of exact quantitative chemical examination.

AN electric current so small that at the pressure and price of the ordinary house lighting current it would cost less than a four hundred billionth of a cent, can be measured with the aid of a new instrument just developed in the standardizing laboratory of the General Electric Company at Lynn, Mass. It is known as a thermionic microammeter, and a current of a ten millionth of an ampere is sufficient to carry the pointer completely across the dial, while a single division on the scale represents one five hundredth of this amount. The instrument will be useful in measuring the minute currents in insulators and radio tubes, but it is stated that the chief application foreseen at present will be in combination with a photo-electric cell for accurate measurements of illumination. At present, the intensity of electric lights, for example, is measured by visually comparing them with another light of standard brightness. The electrical eye, the photo-electric cell, may now replace the human eye in this work, for the cell converts light energy into tiny electrical currents, which may be easily measured with the new instrument.

FIRST experiments in planting California redwood in the East for commercial purposes will be made shortly, when a small shipment of redwood seedlings will be set out in Natural Bridge and other national forests of Virginia, H. M. Sears, supervisor of Natural Bridge forest, has announced. The redwood will be planted on Back Run, near Natural Bridge, in the local forest. It will be given a try-out on experimental plantations of the other Virginia preserves. The work is being done in cooperation with the state forester at Charlottesville.

PNEUMONIA among the natives of Madagascar has been greatly cut down by use of the anti-pneumococcus vaccine developed at the Pasteur Institute of Paris, according to official reports just received in Paris. Pneumonia, with a high mortality, has been responsible for as many as a fourth of the hospital cases in some of the areas. The immunity conferred by the vaccine lasts about a year. The medical authorities in Madagascar have found it wise to give doses of quinine to malarial patients before they administer the vaccine in order to stave off attacks of fever which, when they occur, the natives are likely to consider a direct result of the vaccination. No ill results have been recorded as yet from this double treatment.

NATURE trails, specially laid out paths in state parks and similar areas, with bits of scientific information printed on tags fastened to trees and flowers and animal homes for the benefit of those who walk them, are becoming increasingly popular in the United States, according to Dr. Frank E. Lutz, of the American Museum of Natural History. Dr. Lutz originated the system in a nature trail which he laid out in the Palisades Interstate Park at Tuxedo, N. Y., and has assisted the National Park Service in getting similar trails marked in Yellowstone and other national parks in the West. He states that he expects two hundred nature trails to be in operation during the coming summer.

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SCIENCE NEWS

Science Service, Washington, D. C.

SPIRAL NEBULAE

THE spiral nebulae in the sky, recently shown by an American astronomer, Dr. Edwin Hubble, of the Mt. Wilson Observatory, to be systems of stars like the one of which the sun and other visible stars and the Milky Way are parts, show an almost continuous series of stages in the evolution of stars. This is the opinion expressed by Dr. J. H. Jeans, a leading British astronomer, in an article in *Nature*.

Commenting on a recent paper of Dr. Hubble's, Dr. Jeans states that "he paints a most fascinating picture of the system formed by the great nebulae, and frames it in such convincing observational evidence that it would be difficult to reject it.

"As seen in a telescope, the great nebulae differ widely in shape, size and brightness. But Dr. Hubble brings a mass of evidence to prove that differences in size and brightness between nebulae of the same shape are almost entirely due to a distance effect. If all the nebulae were put in a row at the same distance from us, it would at once be seen that nebulae of the same shape all had approximately the same dimensions and luminosity, while even nebulae of different shapes would exhibit only comparatively small ranges of dimensions and luminosity, especially the latter."

As a result it is possible to estimate the distances of all the nebulae, even the very faintest that can be seen with a powerful telescope. The faintest that can be observed with the great 100-inch telescope at Mt. Wilson, the world's largest, prove to be so distant that light takes 140,000,000 years to reach us from them, travelling about six trillion miles a year. Some two million nebulae lie within this distance, at an average distance of about 1,800,000 light years apart.

Dr. Jeans suggests a model of this vast horde of galaxies. "Take 20 tons of walnuts," he says, "and space them at about 25 yards apart, thus filling a sphere of about a mile radius. This sphere is the range of vision of the 100-inch telescope; each walnut is a nebulae containing matter enough for the creation of perhaps a thousand million suns like ours; each atom in each walnut is a solar system with a diameter equal to that of the earth's orbit."

It is almost certain, according to Dr. Jeans, that the various forms of nebulae represent different stages in evolution, and, incidentally, agree with the sequence which he suggested in 1917 on theoretical grounds. Starting out with a sphere of gas, it changes to an onion-shaped mass, which mathematicians call an oblate spheroid, and then to a lens-shaped figure. Then the gas streams out into two arms where it condenses into many smaller masses which eventually become stars. Finally the whole cloud of gas has been transformed into a cloud of stars.

As these nebulae are approximately equally spaced as far as we can see into the heavens, Dr. Jeans suggests that the nebulae themselves are the result of the condensation of a still earlier cloud of gas hundreds of millions of light years in diameter and extremely tenuous. Such a gas would have had a density expressed as a fraction of that of ordinary air by the figure one over a one followed by thirty-one ciphers. This scheme, he points out, fits in with the law of gravitation, the known properties of gases and survives the test of numerical computation.

THE TSETSE FLY

THE voluntary organization of African natives in a war against the insect which is holding back the development of the continent of Africa, is reported by C. F. M. Swynnerton, British entomologist, in a lecture given recently in Washington.

The tsetse fly, carrier of two forms of sleeping sickness and of a disease fatal to domestic animals, is the root problem to be faced by the countries holding African mandates. It must be satisfactorily settled, Mr. Swynnerton said, before the potential value of Africa as a source of raw materials, a market for manufactured goods, and a refuge of surplus populations, can be realized. It has already invaded large areas of the continent and is spreading rapidly.

The tsetse fly, a relative of the house fly, prevents the keeping of cattle in infested areas. This one effect of its presence is sufficient to hamper seriously any attempt at developing the country. It is even held responsible for immorality of the natives. In Africa cattle are dowry. Without cattle there can be no dowry, hence no marriage.

Mr. Swynnerton has for some time been experimenting in Tanganyika territory with methods of fly control, and has succeeded in arousing the enthusiasm of the natives and in teaching them to help themselves. The dependence of the tsetse upon sheltering woody growth has been Mr. Swynnerton's point of attack. He has showed the natives the necessity of cooperative grass fires over a large extent of country at the end of the dry season. These fires will clear great areas of the tsetse. Those remaining will congregate in grassless thickets which have not been burned through and can be caught before they disperse.

The advance of the bush means advancing infestation and is the cause of sudden depopulation of formerly uninfested areas. Instead of retreating before the onslaught of the tsetse, Mr. Swynnerton has shown the natives how to take the bull by the horns and keep down the bush by cutting. The response has been hearty. Natives have organized by thousands as if for war, and under his leadership, have saved their lands by exterminating the advancing bush.

Another important part of Mr. Swynnerton's policy is to encourage the natives to settle close together. This system of living is in itself a safeguard against the tsetse. By congregating, the population is sufficient to keep down the bush for natural uses such as firewood, building and agriculture.

"Africa can never be developed adequately while the tsetse remains in possession," Mr. Swynnerton said. "I have shown that the case is by no means hopeless. What

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THE DICK ANTITOXIN FOR SCARLET FEVER

In spite of recent important advances in the knowledge and treatment of scarlet fever this much-dreaded disease has taken a big jump over its seasonal prevalence of a year ago. According to the latest reports of the U. S. Public Health Service there are a thousand more cases in ninety-seven reporting cities throughout the country than there were in the same week of the preceding year.

When administered early enough, antitoxin will alleviate the danger of scarlet fever and its frequent subsequent complications. The disease still maintains aspects, however, that render its eradication extremely desirable. A toxin for its prevention has been developed by Drs. George F. and Gladys H. Dick, of the John McCormick Institute for Infectious Diseases, which is also used in a skin test to determine susceptibility. It has been found that increasing doses of the toxin given to susceptibles will render such persons immune.

This is a practical method of preventing scarlet fever and experts in the hygienic laboratory of the U. S. Public Health Service are working on the standardization of the toxin and other problems that must be solved before its general use is practicable. Medical authorities believe that eventually a preventive program for scarlet fever will be built up that will be comparable with that now in progress for diphtheria, which health workers hope to make as obsolete as smallpox.

ANIMAL BEHAVIOR

How a dog or a squirrel feels about things, and what its sensations are like will probably never be understood, is the opinion of modern psychologists who are studying the behavior of animals.

Dr. Carl J. Warden, of Columbia University, who describes the progress of animal psychology in the forthcoming issue of *The Psychological Review*, points out that most psychologists have concluded that it is only guess work to try to describe the purely mental processes of animals in terms of human mental processes since the animals can not communicate their sensations and feelings.

In the sixteenth century the famous essayist Montaigne declared that a fox's decision not to cross a river when the ice is too thin would be reached by "a kind of debating reason and consequence, drawn from natural sense." Montaigne believed that the fox would listen to the rushing water and then think out the situation somewhat as follows: "Whatsoever maketh a noise moveth, whatsoever moveth is not frozen, whatsoever is not frozen is liquid, whatsoever is liquid yields under any weight." And after this convincing logic, the fox would go away.

Such theories as these led medieval philosophers to debate whether animals had souls, and to escape this disturbing problem the famous philosopher Descartes in the seventeenth century went so far as to say that an animal is a simple machine without sensations.

In most psychological studies of animals men of science confine themselves to studying the behavior and physiology of the lower forms of life. Modern scientific men believe that, judging from behavior, many species of animals feel anger, fear, hunger, pleasure and apprehension. Recent experiments with higher apes have shown evidence that somehow they reason and think. But how it feels to be a chimpanzee and how a mind can work without organized language may never be discovered by man.

WOOD-BORING BEETLES

Wood-boring beetles which remained hermetically sealed for 1,200 years in a giant Sequoia tree were recently discovered by Dr. E. P. Van Duzee, professor of entomology at the University of California. When compared with modern specimens it was found that there had been no appreciable change in the species during the twelve centuries.

The beetles had entered the tree after it was struck by lightning, and bred in the wood. Some failed to emerge and were sealed within the wood as new growth covered up the lightning scar. There they were found by Dr. Van Duzee 1,200 years later, as determined by a count of the annual rings. They were in perfect condition, and now form an interesting part of the collection of the California Academy of Sciences.

The failure of their relatives to show any evolutionary changes during twelve centuries is not surprising, it is pointed out, for beetles are a conservative lot, and twelve hundred years is not much time, geologically speaking. Other beetles, the sacred scarabs of the Egyptians, have been preserved by human agency for as much as three times the age of these California specimens, and the scarabs also have shown no change.

On the other hand, the ants and other insects that were captured and preserved in Baltic amber, which was once sticky gum oozing from pine trees on the shore, do show differences from their nearest relatives of to-day. But these insects were sealed into their natural preservative during Oligocene times, about four and one half or five million years ago; which is quite a different proposition from a mere twelve hundred.

APPROPRIATION FOR THE ERADICATION OF THE CORN BORER

The $10,000,000 appropriation voted by the congress and signed by the president on February 23 should, in the next few days, be made available for utilization against the European corn borer, which by its rapid spread is threatening the country's most valuable crop.

When the congress voted this unusual appropriation it carefully provided that no part of the money should be expended until "all states in the proposed control area shall have provided necessary regulatory legislation" and

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The Geology of the Netherlands East Indies, by H. A. Brouwer, Technisches Hoogeschool, Delft, Holland. With 18 plates and 17 text figures. Pp. xii + 160. Cloth. $3.00 net.

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made individual appropriations. This time seems to be near at hand. Three of the five states in the proposed control area, Indiana, Ohio and Pennsylvania, have recently passed in their state legislatures measures empowering federal and state officers to conduct a clean-up campaign. The New York State bill is now in the hands of the governor for signature. In Michigan the bill has passed the senate but is still in the assembly. Unless Michigan holds out it should be only a matter of several days before the fight will be on, says Dr. W. H. Larrimer, in charge of this section of the work of the U. S. Bureau of Entomology.

Sufficient sums have been vouched for by all five states. Their joint monetary contributions will probably amount to a million and a quarter dollars. This, in addition to the regular appropriation allowed the U. S. Bureau of Entomology for corn borer work, and the big special appropriation made by the congress, will make a grand total of about $12,000,000 to be used in the control campaign.

Representatives of the five states concerned have met with representatives of the U. S. Department of Agriculture and have agreed upon a program that will be similar in all the states. The signature of the governor of Michigan to the state bill will be the signal for federal action. There will be inspection of individual farms in the control area, and the farmers will be notified of the measures they must take. Then, after May 1, all infested farms will be reinspected. Farmers who have complied successfully with the regulations requiring the burning of corn remnants and the plowing of fields to a satisfactory depth, will be reimbursed for work done in addition to normal operations at this season. Recalcitrant farmers will see a federal force enter their farms to do the work with its own special machinery. The state will collect from these farmers the farm cost of the enforced clean-up.

ITEMS

WHILE no special predictions had been made of its occurrence, the earthquake which shook Osaka, Kobe, and other points in Japan on Monday, March 7, was not entirely unexpected, according to a statement made by Commander N. H. Heck, in charge of the U. S. Coast and Geodetic Survey's seismic investigations, to Science Service. Commander Heck has recently returned from a trip to Japan. When there he visited Osaka with Professor Matzuyama, of Kyoto University, one of the leading Japanese seismologists, and looked over the very site where great damage was done. Both he and Professor Matzuyama had recognized the possibility of a quake there. Though considerable damage was done on land, the quake was probably centered in the Pacific Ocean off the Japanese coast. The location of the center appeared to be at about 34 degrees north latitude and 137 degrees east longitude. This was based on records obtained by seismographs at Georgetown University, Washington; Fordham University, New York; the Dominion Observatory, Ottawa, Canada; the U. S. Weather Bureau, Chicago, and the stations of the survey at Cheltenham, Md., and Tucson, Ariz.

ACCORDING to information just received at the U. S. Public Health Service from Dr. Wu Lien-Teh, head of the North Manchurian Plague Prevention Service, a severe outbreak of pneumonic plague occurred in Mongolia during November and December. Stringent preventive measures drew a cordon around the infested area. Traffic into Mongolia was stopped. Careful inspection of railway passengers from Siberia was instituted and strict antiplague measures were enforced on the borders between Mongolia and Manchuria. The medical service in the latter region has been able to maintain a constructive program which has been able to keep the plague situation from getting out of hand in spite of the unsettled state of the country. Manchuria has escaped from the disease and no cases have been reported since the middle of December.

SEVERAL new diseases of insects, due to bacteria that have hitherto not been observed, have been reported to the American Museum of Natural History by F. Martin Brown, of St. George's School at Newport. Three species of bacteria and one mould were isolated from a number of dead wood-flies found on an asparagus stalk. Experiments showed that one, which has been named "*Bacillus lutzae*" in compliment to Dr. F. E. Lutz, entomologist of the museum, is fatal to house flies. Another germ proved lethal to the common bright Monarch butterfly. Mr. Brown conjectures that this disease may be the cause of the decline in number of this butterfly in the East during recent years. The researches were carried on at the community hospital at Tuxedo, N. Y., with the cooperation of Dr. Edward C. Rushmore and Miss Margaret Stevens.

THERE are fifty more hospitals in this country now than there were a year ago, according to a statistical survey of hospitals just completed by the American Medical Association. The 6,946 hospitals now in operation in the United States have a capacity of 859,445 beds and the increase over last year is sufficient to take care of an increase in population of 5,000,000 people, association officials state. The total number of hospitals having training schools for nurses comes to over 2,000, of which Pennsylvania has the most in any state, though New York has the largest number of students. There are slightly less than 28 registered nurses for every 10,000 people of the whole population of the country. The lowest supply is in Georgia and Mississippi which have only 7 for every 10,000 people.

DR. JOSEPH M. GINSBURG, of the New Jersey Agricultural Experiment Station, recently reported on his researches with fuel oil as a mosquito-killer, before a meeting at Atlantic City of the New Jersey Mosquito Extermination Association. Oil spread on water to kill mosquito "wigglers" is a standard remedy for the stinging pests and one widely employed, but when vast areas of swampy land have to be treated, as along the Atlantic Coast, the spread per gallon becomes an important thing. In laboratory experiments it was found that the addition of certain organic acids derived from tar would make a gallon of oil blanket half again as much water as could be covered by a like quantity of untreated oil, and that the acidified oil made conditions intolerable for mosquitoes for an appreciably longer time.

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SCIENCE NEWS

Science Service, Washington, D. C.

A RELIC OF THE BRONZE AGE

A WOOLEN mantle, worn in Sweden when the early Pharaohs still reigned in Egypt, has had its age approximately determined by a curious combination of botanical and geological knowledge, through the researches of Dr. Lennart von Post, of the Museum of National Antiquities at Stockholm. The garment was found buried at a depth of several feet in a peat bed in the district of Vastergotland, carefully folded up and weighted down with three stones, but with nothing about it to indicate how it got there.

Its similarity to Bronze Age garments from Denmark and elsewhere suggested its antiquity. The fact that it had evidently not been buried, but had lain in its hiding place while the moss grew over it to form about five feet of peat, was further evidence of great age. The acid water of the bog had preserved it from decay during the centuries.

Dr. von Post found the key to its age in the pollen grains that were thick in muddy particles clinging to the fabric. Most important among the species represented were oak, linden and elm, with pine, birch and alder, and hazelnut as the principal shrub. Exact counts showed that the proportion of the pollen from the oak-linden-elm-forest was larger than it would be in a Swedish spring-time "pollen rain" of to-day, indicating the existence of a milder climate in the North at the time the mantle was laid away.

Such a mild climate is known from geological evidences to have followed shortly after the disappearance of the last patches of glacial ice in the south of Sweden, at about the time the New Stone Age was giving way to the Age of Bronze in that country. It was followed by a period of severer climate, ushering in the Iron Age. This mild-climate pollen thus determines the former owner of the mantle, who so carefully folded it up and hid it under three stones in a ditch as a man of the Early Bronze Age.

The careful workmanship of the weaver, who made the cloth out of a mixture of fine wool and the hair of game animals, probably deer, is described by Emelie von Walterstorff, and the possible romantic history of the garment, which has a number of dagger-holes jabbed through it, is hinted at by Sune Lundquist. Mr. Lundquist states also that the toga of the Romans was quite similar in shape to these elliptical Bronze Age mantles, though differing in size and manner of wearing. A shorter Roman cloak, the "trabea," worn largely by priests and soldiers, was even more nearly similar.

INFLUENZA AND DOG DISTEMPER

HOPE is expressed by the British Medical Research Council, in its recent annual report, that a solution of the influenza problem may come from research in progress on dog distemper. Since distemper in dogs is very similar to influenza in human beings, it is thought that the right weapons for attack on influenza may be forged by the experimental study of the animal diseases most closely resembling it.

This beam of light into the fog of the influenza proposition is dimmed somewhat, however, by the fact that in four years of research instituted by the Field Distemper Fund, workers have not succeeded in cultivating the causative virus outside the animal body. Ferrets, which are highly susceptible to the disease, can be immunized by a killed or inactivated virus, but this weakened virus gives only temporary immunity to dogs. The susceptibility of individual canines to distemper varies greatly, thus adding to the difficulty of testing the effect of protective vaccination.

In order to make immunization of dogs practical, say medical authorities, a virus of known and constant potency must be obtained, the dosage of which can be accurately standardized. Until the virus can be cultivated outside the animal body the protection afforded is incomplete and uncertain. A practical method can only be reached when the nature of the virus and its laws of behavior have been ascertained more completely. When and if these facts are established, however, they may constitute definite signposts to follow in the still more obscure and dangerous disease afflicting man.

THE PREVALENCE OF COMMON COLDS

THE common cold goes to the head of the list as a cause of lost time. In a survey of absences from work in a big industrial firm over a period of ten years, just completed by statisticians at the U. S. Public Health Service, it was found that colds caused a time loss equivalent to 1.4 days per year for every man on the pay roll, and 2.1 days per annum for every female employee. Colds were directly responsible for 39 per cent. of all the absences among the men and for 31 per cent. among the women.

Diseases of the general type known as respiratory caused approximately half of all the absences, but were not so common among the women as the men. Women, it would appear from these records, are more liable to disablement from nervous disorders and diseases of the throat and tonsils, but their disabling illnesses are shorter on the whole than the men's. This condition in favor of the so-called weaker sex is counterbalanced, however, by the fact that their absences were more numerous, totalling 14 calendar days apiece during the whole ten years, while that of the men reached only 8.9.

A high proportion of illnesses occurred among the younger employees, notably among the women. The statisticians suggest that this circumstance may be in part accounted for by the dropping out of the less healthy. The group representing the ages 30 to 35, they state, seems as a whole to have a greater resistance to colds, tonsilitis and stomach disorders than the younger ages.

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THE NATURAL MONUMENTS OF JAPAN

UNIQUE trees and other natural wonders of Japan, once threatened with extinction, are now the objects of special solicitude on the part of the government. An article by Professor M. Miyoshi, of the Imperial University, Tokyo, which will appear in an early issue of *The Journal of Heredity*, tells of the official steps taken to preserve for posterity the natural monuments of Japan.

Among the forests coming under Imperial protection is an especially notable one on the slopes of Fujiyama, the sacred mountain. Other noteworthy trees include a forest of weeping chestnuts, of a variety unknown outside the islands, together with a pendulous-branched variety of a tree called the Cercidiphyllum, not represented by any near relative in the United States. Another protected tree is the Torreya, which is close kin to two American species known by the same name, one in California and one in a small patch of territory in northwestern Florida; these three trees, two American and one Asiatic, are the last relics of what were once world-wide forests of this genus. Other trees, as well as rare and noteworthy smaller plants, are included in the protected list.

One area set aside as a national monument is what might be termed a natural cold-air refrigerator. Near the foot of a volcanic peak is the opening of a lava tunnel, from which a current of cool air constantly blows during warm weather, and in the radius of its influence grow a number of plants usually found high up in the mountains, though this place is only a few hundred feet above the sea.

TEST MACHINERY IN "PADDED CELL"

THE Metropolitan Vickers Electric Company, of Manchester, England, has built a chamber for testing high-speed machinery, which is liable to fly to pieces under the strain. When a piece of such machinery is completed, it is tested in the chamber, which is underground and has walls nine feet six inches in thickness, composed of wood, steel, bags of sand, air cushioning space and reinforced concrete. It is large enough to take "rotors" 14 feet 6 inches in diameter, or shafts 40 feet long. High speed motors turn the machinery under test, which is watched from outside by means of various electrical devices and fast cameras. In addition, by means of a hole bored through a shaft, a special telescope permits actual scrutiny of the interior of a moving part.

The need for such protection is emphasized in a recent issue of the scientific magazine, *Nature*, where it is stated that in a 25,000 horsepower electric generator driven by a water or steam turbine, and running at 3,000 revolutions per minute, the rotating part weighs about 20 tons, and the energy is about the same as that developed in a head-on collision between two railroad trains each carrying fourteen cars and running at 35 miles an hour.

THE SCIENTIFIC INVESTIGATOR

THE scientific man should apply his science to the improvement of himself, according to Dr. William E. Ritter, president of Science Service, in a lecture given on March 23 before the School for Social Research. Dr. Ritter, who spoke on how the scientific investigator uses his mind, stated that the conduct of human beings is about the most important subject for scientific research.

The trained scientist uses his mind as effectively as the opera singer uses his voice, or as effectively as the circus performer handles his body. The scientist, who is often pictured as cold and matter-of-fact, needs imagination as much as the artist does, and would be helpless without it. The scientist, however, is bound by the rules of his game far more rigidly than the artist, because he must check the imagined things against real things more rigorously than the poet or novelist.

"This ability to use the mind for framing imaginary or hypothetical answers to questions, and then to work tirelessly year in and year out, if need be, to prove whether the imaginary answers do or do not correspond to the objective realities in the case is exceedingly far-reaching in its significance for the discovery of truth, and for human welfare."

The investigator must train himself intensively if he is to be a specialist in using his mental processes and his sight, hearing and other senses, and if he is to direct his interests and emotions toward scientific achievement.

ITEMS

WITH official assurance from the Health Administration of the League of Nations that influenza in Europe is subsiding, the population on this side of the Atlantic can breathe a sigh of relief. The United States, thus far in 1927 at any rate, has covered itself with glory where influenza is concerned. The latest figures available at the U. S. Public Health Service indicate that up through March 5 of this year there has been 15 per cent. less influenza in this country than there was during the same period last year. Montana had the best record for the week with no cases at all as opposed to over three hundred for the same week of the preceding year.

WOE to the European corn borer! For $10,000,000 was made available March 14 to carry on extensive warfare for control of this destructive insect. The first actual steps were taken by the government directly following the passage of a bill in the Michigan State Legislature empowering federal and state officers to conduct a clean-up campaign in infested areas. Michigan was the last state to pass necessary legislation provided for by the congress before the congressional appropriation could be expended. "The delay has been serious," says Dr. W. H. Larrimer of the U. S. Bureau of Entomology. "The money should have been available by February 1, but we hope to be able to get the work done in time." The clean-up campaign is to be conducted in the five states of New York, Indiana, Ohio, Pennsylvania and Michigan. Federal inspection of individual farms in the control area will begin at once and orders will be placed for the special machinery to be used by the federal forces on farms where the clean-up measures have not been satisfactorily carried out by the farmers.

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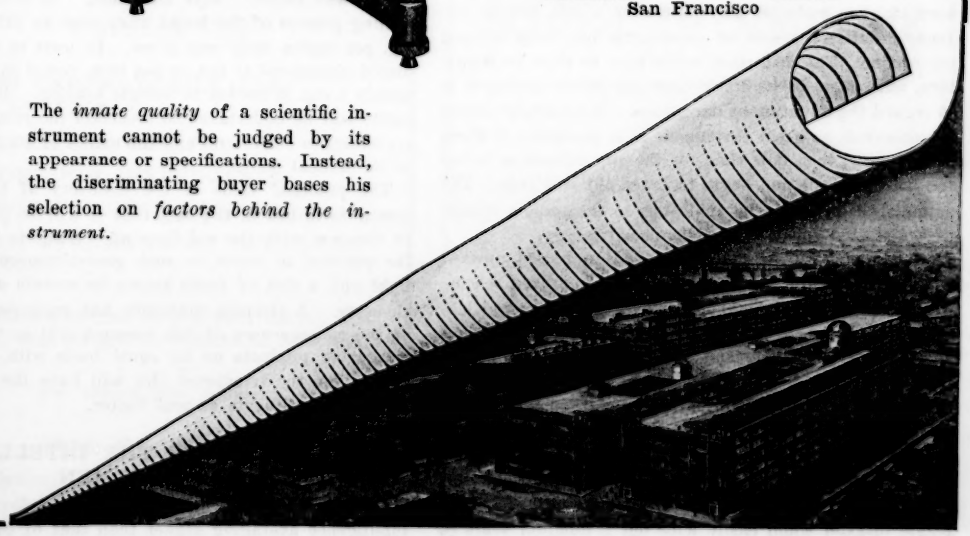

SCIENCE NEWS

Science Service, Washington, D. C.

RESEARCH ON EARTHQUAKES

EARTHQUAKE prediction promises shortly to find a solid scientific basis, according to the plans of Dr. John P. Buwalda, head of the new department of geology of the California Institute of Technology. The institute, in co-operation with the Carnegie Institution of Washington, is embarking on an extensive program of laboratory and field research on earthquakes. The plan, which involves large financial outlay, will cover southern California. While there has never been extensive damage from earthquakes in this end of the state, it is hoped that definite scientific data may be secured in order to determine whether or not a major quake is in the making, and if so where.

Dr. Buwalda tentatively rejects the old idea that a great rock mass may rest silently and immovably under great pressure until some fateful hour when it suddenly cracks and precipitates a disastrous quake. Instead he takes the position that any really dangerous line of rock slippage would already show a crack or "fault" line, in which the two abutting rock masses, temporarily stuck together, would gradually be deformed under a shearing pressure during the period of years prior to a serious earthquake. The situation might be likened to an attempt to slide one piece of stiff taffy past another. As long as the two cohesive masses stuck together a slight distortion or semi-liquid flow would occur along the crack between them while the sliding pressure was being applied.

Dr. Buwalda plans to set a number of monuments in a very precise straight line directly across a suspected earthquake fault. Provided the original survey is highly accurate, the geologist may determine within five or ten years whether the row of monuments has been twisted out of line. The distortion would have to show an S-pattern, and not a direct break from line if the geologist is to regard the situation as dangerous. If no actual curves are observed, no great earthquake is in prospect; if there is distortion, then it is time for the city council to revise the building code and begin to brace old buildings. The actual disaster would be analogous to the sudden release of a distorted spring and its potential energy.

Other apparatus is being designed to record upward tilt of rock as well as the side thrust. Improved seismographic records will be kept not only at the central laboratories at Pasadena, but at widely scattered stations all over southern California. Eventually telegraphic communication is to be effected between these stations so as to afford trustworthy information on earthquake velocity.

This research program is of considerable interest to insurance companies now being solicited for large amounts of earthquake protection. Under present conditions such companies are totally at a loss to estimate hazards, and a single disaster could easily wipe out a hundred years of ordinary premiums or bankrupt the concerns.

VITAMIN D

SCIENTISTS here and in Europe, working in more or less collaboration on the problem, have come to the same conclusion, according to Dr. Alfred F. Hess, of the College of Physicians and Surgeons at Columbia University, that the anti-rachitic vitamin D is formed when certain sterols, a group of substances similar to fats, widely distributed in the lower plants, are exposed to ultra-violet light. Both Dr. Hess and Drs. O. Rosenheim and T. A. Webster, of the National Institute for Medical Research in London, have collaborated with Professor A. Windaus, of Göttingen University, in Germany, who has been engaged in research on the chemical problems involved in the isolation of the anti-rachitic vitamin, for several years.

About two years ago, Dr. Hess reported that cholesterol, occurring in all animal fats and oils, and its counterpart, phytosterol in vegetable foods, after irradiation with ultra-violet light, was the substance actually responsible for preventing rickets. Irradiated cholesterol in very much smaller doses would produce the same results as cod liver oil, only one millionth of a gram being necessary to protect a rat from rickets.

Now, however, another step in the pursuit of the vitamin has been accomplished. The English workers, Dr. Hess and Professor Windaus, of Göttingen, all believe that it is only a small portion of the cholesterol which is activated by ultra-violet light. This is an allied substance called ergosterol. This compound is widely distributed in lower plant forms and only very minute quantities are needed to protect laboratory animals from rickets.

"It was found," says Dr. Hess, "to bring about a healing process of the bones when even as little as .0003 mg. per capita daily was given. In tests in which irradiated cholesterol is fed, it has been found that approximately 1 mg. is needed to initiate healing. Other experiments will be undertaken to ascertain the relationship of ergosterol to cholesterol and the extent of its distribution in the animal body."

The practical value of the discovery of this concentrated form lies in the fact that it will be possible now to dispense with the cod liver oil. Hitherto it has been the practice to resort to such general remedies as sunlight and a diet of foods known to contain anti-rachitic elements. A German authority has suggested that one of the consequences of this research will be to put oleomargarine products on an equal basis with butter and cream, for the irradiated oleo will have the same anti-rachitic constituents as real butter.

MEASUREMENT OF THE INTELLIGENCE OF POLICEMEN

ONE California town, at least, has a police force with intelligence averaging higher than that of college freshmen and army officers. This announcement, following on

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the heels of statements that policemen in American cities are unintelligent, is the result of an investigation made by Maud A. Merrill, of the department of psychology of Stanford University.

The investigation was designed to find out whether men of comparatively high intelligence and ability make good policemen and are satisfied with the work, Miss Merrill reports in the number of *The Journal of Personnel Research* to be issued in April.

For two years, each applicant for the Palo Alto force has been given the Alpha intelligence test used to grade the mentality of United States soldiers during the war. Out of 113 applicants, 30 were chosen on the basis of their intelligence together with the impression they made on the examiners.

"The average Alpha intelligence score of men who have remained on the Palo Alto police force for two years is 143.5, a score higher than the average for army officers and higher than that reported as the freshman average at many colleges."

"The median score of men who have been discharged for inefficiency or for conduct unbecoming an officer is 137. Men who left voluntarily for better jobs have a median score of 171.5. One of these men left the police force to go into grand opera." The median Alpha score made by white drafted soldiers was about 60.

Previous investigations have indicated that bright, capable young men do not remain in the police service as a career, the average mentality of patrolmen being higher in some cities than the mentality of sergeants and lieutenants.

Salaries in Palo Alto are not larger than in other towns. Miss Merrill's explanation as to why policemen of intelligence seem content to enter the force and stay there is that the force is directed by a chief who is progressive and capable and that possibly perhaps the organization itself under capable leadership offers an incentive to capable, intelligent men in police work.

THE ELECTRIC MOULDING OF RUBBER

INNER tubes, water bags and other articles of pure rubber, stronger and more durable than rubber obtained by any other process, are now being made by electric moulding, essentially the same process that is used in electroplating silverware and in making cuts for newspaper pictures, according to the Engineering Research Foundation. The process was worked out by two groups of research workers, one in America and one in Hungary, neither of whom knew that the other was engaged in the problem. The American workers were S. E. Sheppard and L. W. Eberlin, of the Eastman Kodak Company, and the Hungarian group was led by Paul Klein and A. Szegvari.

Both groups were practically interested in improvement of the quality of rubber goods, according to a statement made by an officer of the Engineering Research Foundation. They knew that when the solid dried crude rubber is worked upon a mixing mill in the rubber factory, the rubber substance was made softer and weaker. They knew that the less rubber was heated or worked, the better was its quality. They also knew that research of chemists in recent years had shown how vulcanization may be carried on at lower temperatures than formerly and the necessary sulphur combined with rubber with minimum of loss of quality. Certain substances known as accelerators possess the property of permitting vulcanization to be accomplished at relatively low temperatures. However, if these accelerators were incorporated on the usual mixing mill, the temperature would be sufficiently high to cause vulcanization during mixing and spoil the goods.

These men conceived the plan of so depositing rubber on forms, from latex, that the rubber particle itself was not altered, and made the astonishing discovery that electro-deposited rubber had the highest quality ever observed. There were many problems to be solved before this was made practical. It was necessary to incorporate other substances to be deposited simultaneously, such as sulphur, zinc oxide and carbon black. These latter two substances are necessary in rubber goods to give toughness. A long investigation was carried out to find means to disperse them in water, mixed with the latex particles, without coagulating the latex. A noteworthy achievement has been the discovery of means by which these rubber layers may be free from bubbles, for when an electric current is passed through a solution, bubbles of gas are formed on anode and cathode. So they hit upon the scheme of surrounding the anode with a porous clay diaphragm. The anode is therefore immersed in electrolyte inside a porous clay cell or dish and the rubber particles, together with those of zinc oxide, sulphur, etc., are deposited upon this porous so-called anode diaphragm. Thus the rubber as it collects forms a continuous homogenous, tough covering of uniform thickness. Any thickness up to an inch or more is practicable. Rubber thus formed is stronger than rubber prepared by the old methods, and is free from gas or air holes.

Industrial development is already well advanced. Continuous, automatic production of certain kinds of articles is feasible. Manufacture of inner tubes for automobile tires is the most important application, if quantity be the criterion. Bathing caps, stationers' plastic bands, tobacco pouches and hot-water bottles are other examples. Insulation for wires and other things electrical is another application. No high temperatures are used. For impregnating textiles the rubber can be more intimately applied to the fibers.

AGRICULTURE AND SCIENTIFIC RESEARCH

THE benefits derived by agriculture from the applications of science were outlined by Secretary of Agriculture W. M. Jardine in an address, on March 29, before the American Institute of Chemists meeting in New Haven.

Science began its work for modern agriculture over a century ago, Secretary Jardine stated, with the classical work of Boussingault, de Saussure and Liebig on fertilizers, a field in which research still continues on an ever-increasing scale. The Babcock test for the butterfat content of milk, Sabatier's process for hydrogenating

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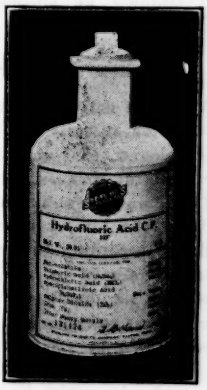

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vegetable fats, Biot's influence on the increase of sugar in beets, and the work of Osborn and Mendel, of Yale, in accurately measuring the food requirements of cattle, were among the special accomplishments cited by the speaker.

In conclusion, Dr. Jardine made a plea for greater attention to, and increased support for, fundamental research in pure science. He said in part:

"American science, I am convinced, needs to concern itself more with fundamental research than it has done heretofore. No country in the world has made such progress in applied science, but our record in pure science is not so flattering. Since 1900, when the Nobel prizes in physics, chemistry and medicine were inaugurated, 76 awards have been made. Of these, 24 went to Germany, 11 to England, 10 to France, 6 to the Netherlands, 5 to Sweden, 4 to the United States, 3 to Denmark, 3 to Switzerland, 2 each to Austria, Canada, Italy and Russia, and 1 each to Belgium and Spain. On the basis of population, the Netherlands, Denmark, Sweden and Switzerland received one to every million inhabitants; Germany one to every two and one half million; Austria one to every three million; England one to every three and a quarter million; France one to every four million; the United States, one to every twenty-nine million. This is the situation despite the fact that we have vastly more students in colleges and universities in proportion to the population than has any other country in the world. The difficulty seems to me twofold: We are not laying enough emphasis on pure science in proportion to our emphasis on the applications of science; and we are not stimulating and training an adequate personnel in scientific research."

ITEMS

VOLCANIC activity of more than unusual intensity has been noted recently by Dr. T. A. Jaggar, government volcanologist, at Halemaumau pit, the liveliest spot in the crater of Kilauea, the world's largest living volcano. "There was a fresh reddening of the whole northwest wall of the pit where a large shell of the wall had fallen," according to Dr. Jaggar. "The débris slopes below were seen to be covered with reddish rocks and dust, and the dusting of the bottom of the pit extended clear across to the south taluses. Most of this had been accompanied by small slides from the decomposed rock of the northwest wall. But there had been at least one big avalanche, which had carried away the greater part of a pronounced bench at the west end of the big intrusive sill which forms the lower part of the northeastern wall. The dusting of the bottom of the pit was further evidence of a big avalanche, and the middle talus of the northeast wall showed more fresh débris. The yellowing of the southern solfataras continued to be conspicuous.

STUDYING the light given off by ash of tumors burned in an arc light is the latest method of attacking the cancer problem, one which has been applied at the Hahnemann Medical College by a trio of biologists and a physicist, Donald C. A. Butts, Thomas E. Huff and Frederick Palmer, Jr. By means of a spectroscope, which analyzes the light, and reveals the elements that cause it, they have found that the yellow lines due to sodium, and which appear only momentarily when the ash of normal animal tissue is placed in the arc, persist until it has all been consumed when the ash from tumors is analyzed. This shows the presence of the element sodium in cancerous tissue.

THE remains of a complete Indian village perhaps a thousand years old have just recently been uncovered near Alamo, Contra Costa County, California, by Glenn Fisher and Raymond Kraft, of Concord, Calif. The discovery was made on the rim of Mt. Diablo, where Bret Harte first taught school and where he was inspired to write his fascinating tale, "The Legend of Monte Diablo." A quantity of skeletal material, ornaments, weapons, utensils, shell, ashes, firestones and bone material have already been removed from the ruins. Further excavations, however, are now being held up pending legal action by the Alamo Chamber of Commerce, who are opposed to the transfer of these relics to a museum. "An Indian burial ground is its own best museum," according to Lyman K. Stoddard, president of the Alamo Chamber of Commerce, who further states that his community has one of the few intact Indian buried villages and they "are not going to let souvenir hunters carry off valuable historical material."

FURTHER evidence that plants must have something in addition to their regular diet of the seven chemical elements classically supposed to be all-sufficient for the support of plant life is produced in the forthcoming issue of *The Botanical Gazette* by Dr. A. R. C. Haas and Dr. H. S. Reed, of the Citrus Experiment Station at Riverside, Calif. The two experimenters were growing young orange trees in pots, watering them with a solution supposed to contain everything a reasonable young plant might require, when they found their specimens getting decidedly sick. The leaves curled and became discolored, and in general the seedlings looked very much distressed. A very minute addition of a number of elements which have always been considered useless to plants, including aluminum, titanium, bromine, strontium, lithium and boron, was found to be the proper medicine to restore the ailing trees to full health.

SALTING asparagus beds as a part of the regular fertilizer program, long a traditional practice among gardeners, has received the sanction of science, according to a report by Dr. William Rudolfs, of the New Jersey Agricultural Experiment Station, which will be published in the forthcoming issue of *The Botanical Gazette*. One hundred and fifty pounds of salt per acre is not enough, Dr. Rudolfs's experiments disclosed, for plants on plots treated with this amount showed no increase in numbers of stalks over plants on unsalted plots. But doubling the amount of salt resulted in an increase in average number of stalks per plant from six to nearly seven; and a salt dose of 500 pounds per acre brought the yield per plant up to about seven and one half stalks.

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SYNTHALIN AND INSULIN

A SYNTHETIC drug that acts like insulin in remedying diabetic conditions, but which can be taken by mouth instead of necessitating troublesome daily injections with a hypodermic needle, is the discovery reported by Dr. E. Frank, of the University of Breslau.

The new compound is a derivative of guanidin, a substance long well known to organic chemists, and has been named "synthalin" by its discoverer. It is not nearly so powerful as insulin in the crystalline form, first prepared by Dr. John J. Abel, of the Johns Hopkins University, but its effects are indistinguishable from those of the natural drug produced from the pancreatic gland. Injected into the blood stream of laboratory animals afflicted with diabetes, it quickly reduces their blood sugar concentration to normal, and an overdose produces the convulsions that are a symptom of excessive insulin. These convulsions can be cured by injecting sugar solution, as they are in the case of those produced by the natural insulin.

Dr. Frank states that the new chemical will be of use chiefly in the treatment of mild and moderately severe cases of diabetes, and he cautions prospective users to be exceedingly careful in regulating the size of the dose. Synthalin alone, he says, will not avail against diabetes in its more advanced stages. In these the frequent injection of insulin is still the only effective treatment. But even here, he claims, synthalin will be useful as an auxiliary medicament, for by swallowing properly adjusted doses of it the patient can cut the number of insulin injections needed daily from three down to one.

THE CAUSE OF RHEUMATISM

THE heavy economic and industrial losses resulting from acute rheumatism has led the British Medical Research Council to instigate one of the most exhaustive surveys of the prevalence of this disease among the poorer classes ever undertaken. Medical men have long recognized that the causative factor of rheumatism probably has something to do with the conditions arising from poverty, since it occurs with comparative rarity among the well to do. The investigation just completed is an attempt to ascertain means of preventing its high incidence among the children of the very poor.

A specially appointed committee investigated the families of 700 rheumatic children, charity cases in hospitals in London and Glasgow. The families of 200 children, receiving hospital treatment for non-rheumatic diseases, but of otherwise similar circumstances were observed as controls. In addition the committee went into the histories of some 2,000 children with rheumatism attending the Poor Law Schools.

The results of this detailed survey indicate that infected tonsils and damp housing conditions do not have as close a connection with the disease as many physicians have formerly believed, but the family incidence of the disease runs high. In 31 per cent. of the families of the rheumatic children relatives living in the same house were afflicted with the same malady. Over-crowded living quarters and several children sleeping in the same bed were an all-too-common circumstance featured in the report.

The committee frankly admits that the conclusions to be drawn from the investigation are mainly negative, but it points out that the prevalence of the disease in other members of the family suggests several possibilities: there may be a tendency to inherit rheumatism, it may be due to similarity of environment or it may be transmitted from person to person by contact. More research still is needed to show which line of effort should be followed to make rheumatism preventable.

OXYGEN IN SOILS

DR. LEE M. HUTCHINS, of the Department of Agriculture, Washington, D. C., has published in *Plant Physiology* a series of experiments carried out in the laboratory of plant physiology of the Johns Hopkins University under the personal direction of Professor Burton E. Livingston on the supply of oxygen present in various soils under different conditions and the effects of this varying supply of soil oxygen on the germination and growth of a number of varieties of seeds.

It was found, for example, that rice requires very little soil oyxgen, wheat considerably more and cotton a great deal. The oxygen-supplying power of different soils varies. Sandy loamy soils supply more oxygen to plant roots than heavy or clayey soils; a soil supplies less oxygen when wet than when dry; less when packed than loose, and the supply decreases with the depth from the surface.

These experiments agree with the well-known facts that rice thrives in heavy soils with plenty of water and little cultivation while cotton requires drier, lighter soil and more cultivation.

Delicate and complex apparatus for determining the oxygen-supplying power of soils was perfected by these experimenters and described in detail by Dr. Hutchins, who suggests the broad field of study just beginning to be opened up by these and other experiments in the quantitative requirements of water, oxygen, carbon-dioxide, etc., in plant growth.

BIRD MIGRATION AND GLAND ACTION

ELECTRIC lights that hoodwink deluded hens into laying financial profits into their owners' pockets in the winter time are now being utilized in much the same way to further scientific knowledge about the causes of bird migration.

Dr. William Rowan, associate professor of zoology at the University of Alberta, believes that migration may depend on the production of an internal secretion or hormone by the reproductive organs during certain stages

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of regeneration. It is well known that the sex glands of birds undergo marked seasonal changes that various authorities have endeavored to link up with the phenomena of migration; and this last winter Dr. Rowan has endeavored to prove his theory with a series of ingenious experiments.

About two hundred juncos, hardy little birds common in southern Canada and the northeastern states, were trapped, divided into two groups, and placed in two unheated aviaries. In this experimental aviary the length of the birds' day was artificially increased by the lights at the same rate it would normally increase in the spring. The other birds were left to get along with mere daylight.

Laboratory investigation of a control and an experimental bird in the middle of the winter showed that the organs of the bird in the lighted aviary were in the condition normally found in birds in spring, while those of the inmates of the unlighted bird house were still in the quiescent state characteristic of the winter season. Juncos released from the unlighted aviary hung around the same locality all winter, displaying no desire to continue their wanderings, but only a few of those released from the lighted house were recovered by the experimenters. This Dr. Rowan interprets, in a report to *Nature*, as meaning that birds whose organs are in the quiescent state of minimum activity of winter have no desire to set about the strenuous business of migration.

AN ELECTRIC RELAY

MECHANICAL window displays that automatically start to operate when a person stops to watch, lights of a city that may be turned on by a single drop of rain, or costly jewels, loosely laid around and apparently unprotected, but arranged so that a bell loudly rings when a prospective crook's hand draws near, are now a possibility as the result of a new electric relay. The device, which was invented by D. D. Knowles, research engineer of the Westinghouse Electric and Manufacturing Company, was publicly demonstrated recently for the first time.

It is known as the Knowles grid-glow relay, and resembles a radio set vacuum tube in appearance. When properly connected, a billionth of a watt of electrical energy, about one fortieth the amount of energy exerted by a fly climbing an inch in a second, is sufficient to control the flow of a current a hundred million times as great, and this current, in opening or closing another relay, can control currents as high as twenty-five amperes, as much as is used to operate large motors.

Though exhausted of air, the tube contains neon, argon, or some similar gas which is chemically inert. Like a radio tube, the parts within are an anode, a cathode and a grid, but there is no filament. When the anode and cathode are connected to the two terminals of a circuit of about 440 volts no current flows, because there is an electrical charge built up on the grid which blocks it, as long as the grid is insulated. But if the grid be connected to the ground, the blockade is lifted and the current flows and operates any device connected in the circuit.

In the demonstration made showing how jewelry may be protected, a watch was laid on a plush cover under which was a piece of tinfoil connected to the grid of the relay tube. As soon as the hand was brought near the watch, and the tinfoil, the electrical charge on the grid is removed. The tiny amount of electrical energy jumps from the tinfoil to the hand. The grid being discharged, the 440-volt current flowed through the tube, and operated any device in the circuit. A drop of water falling on two fine wires, a photoelectric cell sensitive to light variations, or a flame under two parallel wires, were substituted for the hand and tinfoil arrangement. Possible applications of the device suggested by Mr. Knowles are to guard exhibits in stores and museums, turn lights on and off at nightfall and daybreak, warn of thunderstorms and give alarms when intruders enter doorways or halls.

ITEMS

WITH the collaboration of other entomologists, the U. S. Bureau of Entomology has been keeping records of insect conditions in all parts of the country and issues monthly reports of the work so that every official entomologist in the United States knows the exact condition regarding injurious insects throughout the country from month to month. In this way they get warning of the spread of imported pests often in sufficient time to help them to lay plans in advance. Through this insect pest survey it is hoped that clues may be gained to the causes of the sudden increase in numbers of certain pests.

CALIFORNIA walnut growers are much concerned over the inroads of the codling moth on walnut orchards, according to the California Experiment Station. This moth is the same that is now all too well known to apple growers. It is present in nearly all orchards of California to some degree and is very prevalent in some localities. In one particular orchard 31 per cent. of the trees were infested. It has been found that it moved freely from apples to walnuts and its behavior was practically the same on both. The insect lays eggs in the undeveloped flower which is stimulated to rapid growth. The larvae that emerge from the eggs are soon provided with abundant food in the surrounding tissue at the expense of apple or walnut host. Spraying the trees with 15 per cent. solution of basic arsenate of lead in the early weeks of June or as soon as possible after the moth eggs are hatched is the method of extermination. Dusting the trees is sometimes tried but is not as effective as spraying.

PINEAPPLES and sugar are the two principal industries of Hawaii, but a third is rapidly being established to make use of lands too wet for pineapples and too high for cane. This is starch, to be made from the edible canna. For fifty years Australia has furnished the market with arrow-root, which is starch from the root-stock of this plant. The familiar canna of our gardens has tubers rich in starch, but the edible species has a very much larger spread of underground stems filled with starch that is easily separated from the fiber for market use. Hawaii has used the plant extensively for stock feeding and there seems to be no reason why it should not be very profitable for commercial use when established.

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SCIENCE NEWS

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EFFECTS OF POLARIZED LIGHT ON VITAL PROCESSES

A NEW and hitherto unsuspected influence of the quality of light upon vital processes was announced to the American Chemical Society in session at Richmond, Va., this week, by Dr. David I. Macht, of the Johns Hopkins University. It is well known that a difference in the wave length of light, that is, the frequency of vibration, makes a marked difference in its action on plants and animals; that, for instance, rickets may be cured by light of high frequency, such as the ultra-violet rays. Now Dr. Macht has found that the direction of the vibrations also makes a difference in its effects. If the vibrations all lie in the same plane, like a wavy line on a sheet of paper, the action is different than if the vibrations occur in all directions promiscuously as in ordinary light. This peculiar form of light is called "polarized" because the vibrations have a single direction. But it can not be distinguished by the eye from ordinary light. Ordinary light, such as sunlight, can be polarized by reflecting from a plate of glass or sheet of tin set at a certain angle.

An Englishwoman, Miss Elizabeth Semmens, reported in 1923 that polarized light would promote the conversion of starch into sugar. Dr. Macht has confirmed this and gone much farther. Rays of polarized light are found by him to stimulate the growth of yeast and bacteria. Sprouting beans and sunflower seeds grow more rapidly under polarized light than under common light of the same brightness. Certain drugs, such as digitalis, cocaine and quinine, lose in their medicinal power on exposure to polarized light.

Still more interesting is the discovery that polarized light causes sick and poisoned rats to succumb more quickly. Injections of santonin or cocaine caused rats exposed to polarized light to be seized with convulsions, and usually die, sooner than those similarly dosed but living in common light. Rats which had been reduced to poor health, by feeding them on a diet deficient in vitamins, were taken with convulsions and suddenly died when exposed for several hours to ultra-violet rays.

These discoveries may aid to explain the irregular and uncertain action of drugs and course of diseases which now perplex the doctors. Daylight is often partially polarized by reflection from sea, snow and sky. Moonlight is largely polarized by the reflection of the sunlight from the surface of our satellite. This may suggest to the reader the possibility that some day science may find some grain of truth in the old folklore theories of the influence of moonlight on plant growth and decay.

CATHODE RAYS FOR DRYING PAINT

CATHODE rays, which aroused great expectations of practical applications a few months ago when Dr. W. D. Coolidge, of the General Electric Co., exhibited a more powerful machine for producing them, are already fulfilling their hopes. At the meeting of the American Chemical Society their effect in speeding up the drying of paint materials was discussed by Professor J. S. Long, of the chemistry department of Lehigh University.

In collaboration with a group of his associates, Professor Long exposed a number of glass plates coated with linseed oil, perilla oil and China wood oil, all standard paint materials, to the action of rays from the Coolidge tube, and also exposed similar samples to blasts of warm air and to beams of ultra-violet rays to obtain comparisons of the speed of drying and hardening produced by these methods.

"The time required for the oil, without drier, to become dry to the touch or to dry hard, was found to decrease in a regular manner as the time of exposure to cathode rays increased up to 10 minutes. Perilla oil, without driers, rayed for 10 minutes was dry to the touch in 2 hours and hard in 5 hours. Linseed oil rayed for 10 minutes was dry to the touch in 3 hours and hard in 6 hours at 60 degrees Fahrenheit. Raw perilla and linseed oils, without driers, flowed on the same glass plates at the same time, were wet and not much changed when the progressively thicker films from rayed samples were all dry."

In a second paper, Professor Long discussed the properties of a synthetic compound resembling linseed oil in its quick-drying effects. It bears the descriptive chemical name "linolenic monoglyceride," and was artificially made with acids derived from linseed oil and perilla oil as a basis. It is the hope of Professor Long and his coworkers eventually to obtain a series of such synthetic oils that will free the paint and allied industries of their present dependence on vegetable oils that can never be produced in sufficient quantity to satisfy the demand and hence are always expensive.

MANGANESE AND COPPER FOR PLANTS AND ANIMALS

MANGANESE, best known through its use in alloy steels, and the common element copper are needed in microscopic quantity to maintain good health in plants and animals, according to Professor J. S. McHargue, of the Kentucky Agricultural Experiment Station, who spoke before the meeting, at Richmond, Va., of the American Chemical Society. Dr. McHargue said, in part:

"Carefully controlled experiments show that plants will not grow in sand cultures containing adequate amounts of purified compounds of the so-called ten essential elements after the plant food material contained in the parent seeds has been exhausted. The addition of a small amount of a manganese compound causes a very marked increase in the growth of the plant and a small amount of copper in addition to manganese makes larger and more nearly normal plants.

"Small amounts of manganese and copper are normal constituents in the tissues of animals. Marine and fresh water mollusks are quite rich in manganese, copper and

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zinc. Birds apparently contain more manganese than some of the higher types of domestic quadrupeds. The liver, kidneys, spleen, pancreas, heart and brain contain more of these elements than the lean muscular tissues or the blood.

"The Bluegrass region of central Kentucky is underlain with phosphatic limestones which produce a soil relatively rich in manganese, copper, zinc, nickel and cobalt, and the presence of these elements can be detected in the forage crops produced from the soils of this region. It is therefore assumed that the presence of these elements in the herbage is a contributing factor in the development of the superior specimens of livestock for which the Bluegrass country has long since attained a world-wide fame."

A NEW INSULATOR TO REDUCE THE COSTS OF POWER TRANSMISSION

CHEAPER electric lights and less expensive electrical heating are possible outcomes of recent work on electrical insulations by a group of Russian scientists under the leadership of Dr. Abram Joffe, head of the Physical-Technical Institute of Leningrad.

Dr. Joffe will describe his researches on a new type of insulating material, which scientists believe may revolutionize the whole aspect of high-power transmission problems, in a forthcoming issue of *The Journal of Mathematics and Physics* of the Massachustts Institute of Technology. As a result of this work entirely new ways of manufacturing electrical insulators may be opened up.

He has found that a very thin layer of a comparatively cheap and readily available varnish-like material substitutes for the large bulky porcelain insulators now used. Investigation of the dependence of dielectric strength, that is, the resistance to electrical puncture or breakdown, on the thickness of a sample has shown that considerable potentials can be insulated by very thin films, their dielectric strength approaching the tremendous figure of 100,000,000 volts per centimeter of insulator thickness.

In addition to giving the electrical industry a new insulating material, Dr. Joffe's work gives the experimental physicist a new method of subjecting materials to immense pressures. When the electrical current is in a wire it creates pressure at the wire's surface in trying to get out. Since Dr. Joffe's new insulating material resists the electricity's efforts for freedom more strenuously than other materials, greater pressures are created at the surface of the conductor than ever before obtained. He has obtained the extraordinary pressure of 300,000 atmospheres, some 4,500,000 pounds per square inch. The highest pressure previously obtained in scientific work has been 40,000 atmospheres, secured by Professor P. W. Bridgman, of the department of physics at Harvard University. Since such high pressures squeeze the atoms of the metal tighter together than ever before, it is predicted that new knowledge about the properties of matter, especially the spacing of the atoms, will result.

In high-voltage power transmission, high potential currents are likely to flash from pole to pole, to other wires and sometimes to the ground. To prevent this, there are used high towers equipped with cross arms that hold the wires a considerable distance apart, suspended from costly porcelain insulators. With the new methods it may be possible to reduce the size of insulators so that the wires can be laid in conduits, thus doing away altogether with the expensive pole construction in use at present.

Dr. Joffe has been studying the problem of electrical insulation for many years and is at present engaged in giving a course of lectures on the electrical and elastic properties of solids in the department of physics at the University of California. American physicists are of the opinion that Dr. Joffe's new discoveries, when more completely developed, will have not only the highly desirable practical results of making electrical heating and lighting cheaper, but will be invaluable in the branches of engineering and physics that employ high voltages.

FAST-GROWING TREES FOR PAPER

FAST-GROWING hybrid poplar trees, grown as a farm crop, may before long compete with corn and cotton for a place in the farmer's fields. To meet the ever-increasing demand for wood pulp for the paper-making, rayon and other industries, three scientists, representing an alliance between botany and chemistry, and also between pure research and applied science in industry, have undertaken to see what can be done about getting new varieties of trees big enough to use in less time than it takes the natural species to grow in the forest. These three men, Dr. A. B. Stout, of the New York Botanical Garden; Dr. Ralph H. McKee, of Columbia University, and E. J. Schreiner, of the Oxford Paper Company, now announce that they have succeeded in obtaining new hybrid varieties of poplar that will reach a trunk diameter of eighteen inches in eighteen years, giving a total yield of 100 cords to the acre. Part of the crop can be harvested at the end of ten years, to thin out the stand, and the balance when the trees have matured.

The unusually rapid growth of the new varieties, the investigators explain, is due to a phenomenon long known to breeders, called "hybrid vigor." It is not at all well understood, but in plant and animal husbandry it is much used to obtain thriftier crops and stronger and larger livestock than can be got by sticking to unmixed species. The superior strength and endurance of the mule, a hybrid between the horse and the donkey, are credited to this hybrid vigor, and many of our best field and garden crops have been obtained in the same way. A few tentative experiments have been made in the past with hybrid forest trees, but the present work is the first endeavor to apply the principle to the development of a tree needed for a group of major industrial operations.

DEATHS FROM ALCOHOLISM

STATISTICIANS of the Metropolitan Life Insurance Co. have made a comparative study of the death rate from alcoholism among their policy holders for the several years succeeding the enforcement of the eighteenth amendment and for an equal number of years before.

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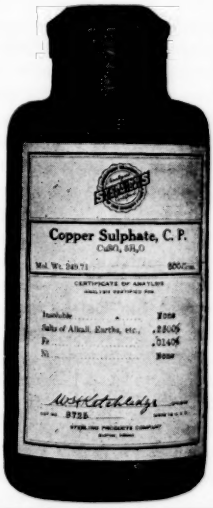

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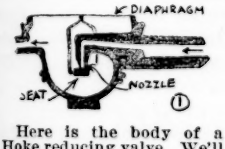
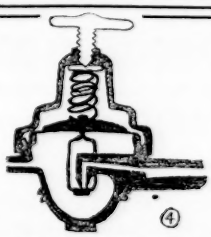
What *is* a Hoke Reducing Valve, Anyway?



Here is the body of a Hoke reducing valve. We'll connect it with a tank of compressed gas. The seat presses against the nozzle, and no gas can enter.

Let's put pressure on the diaphragm. This opens a space between nozzle and seat, and gas comes through. Press harder, and more gas comes through.

Now let's shut the outlet. The incoming gas will lift the diaphragm and make the seat close the nozzle. This prevents any more gas from entering.



Let's put a spring on the diaphragm, and a set-screw. Now we can screw down a little, or a whole lot. In that way we **regulate** the **delivery pressure**, as we want it—high or low.

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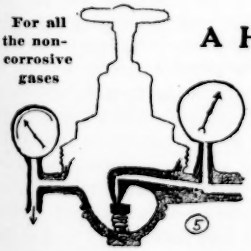

Now we'll put in a big gauge, to tell the tank pressure, and a small gauge to tell the delivery pressure.

We also put in a back spring, under the seat, to support and steady it.

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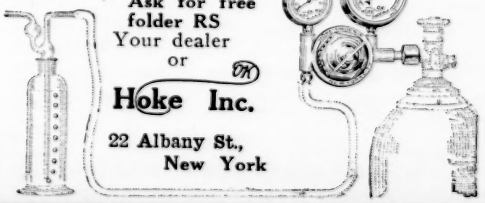

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Their results show that the increase of such deaths since 1920 has been very general throughout the country and is many times greater than the prevailing rate in Canada. Under alcoholism have been included all records of deaths known to be due to acute alcoholic poisoning from post-war bootleg liquor. All together they constituted in 1926 4.1 per hundred thousand deaths among the policy holders of the company or exactly the same percentage as prevailed in 1911, the first year of the period studied. This was the highest death rate since 1917, and shows an increase of 24 per cent. over 1925.

The condition is pretty much the same throughout the whole United States, but Maryland and New York appear to have suffered the most, for the rate of the former, 10.1 deaths per hundred thousand, is the highest ever recorded from that state. New York was a runner-up with 6.3, surpassed only in 1913, 1914 and 1916. These figures, which are for a representative slice of the industrial population, are in close agreement with those for the general population up to 1925, the latest year on which statistics are available. They show, the statisticians say, that alcoholism is not restricted to any economic class or to any limited area of the country, but tends to be even higher among the general population than among the wage-earning groups.

Though the deaths from straight alcoholism have been increasing, the ones from acute alcoholic poisoning have been progressively falling off, indicating that on the whole the bootlegger and home brewer are gradually perfecting their product so that it constitutes less of a menace to life.

The alleged increase of drinking among young people has not yet succeeded in materially lowering the average age of those dead from alcoholism, at least men. The average for women has decreased in the last two years, but only slightly.

ITEMS

A DRUG that makes an individual see yellow is the subject of experiments by a Scottish scientist, Wilfred Marshall, of the University of Aberdeen. The drug is known as santonin and is prepared from the dried flower heads of the European wormwood. In his experiments, reported in *The Journal of Pharmacology and Experimental Therapeutics*, Mr. Marshall administered doses of santonin to an elderly man experienced in discriminating colors. Doses of a half gram or more caused objects to appear yellow to him within half an hour after the dose was taken. The yellow vision was most noticeable on coming from a darkened room into daylight and was best seen through the windows viewed from a dimly lighted room. In diffuse daylight its intensity quickly diminished to a greenish-yellow veil. Artificial lights viewed in the evening seem a deep yellow in hue. It has not yet been determined just how the drug accomplishes its peculiar effect.

SCARLET fever and measles together caused only 176 more children's deaths than automobiles throughout 41 states during the year 1925, according to figures recently compiled by the Metropolitan Life Insurance Co. In that year automobiles killed four children to every seven killed by diphtheria. Nearly 40 per cent. of automobile fatalities happen to children under fifteen, while the mortality is particularly heavy between the ages of five and ten. Approximately 11 out of every 20 lives lost in accidents to pedestrians were those of children. Though the automobile deaths of little children run into thousands annually the statistical survey indicates that it tends to become higher rather than to decrease. Safer streets through stricter traffic regulation, more playgrounds to keep children off the streets, and home training to instruct the young idea in the hazard of street play to life and limb, are suggested as possible lines of attack to preserve America's children from the menace of the automobile.

DR. BELA DORNER, head of the laboratories of the Royal Hungarian Railways, has recently come to this country with a process which he states is commercially practicable for the utilization of corn stalks in the manufacture of paper, rayon, auto finishes, and many other products for which wood pulp at present is the only satisfactory basis. A number of New York capitalists have become interested in the possibilities of Dr. Dorner's method, and a prominent consulting chemist retained by them has reported favorably on it, after a series of large-scale tests. It has long been known that cornstalk substance is chemically and physically suited for the needs now met only by wood pulp, but certain practical difficulties prevented the development of a stalk-pulp industry. One of the chief obstacles in processes hitherto tried has been the necessity for cutting out the hard cross-plates at the joints, which made too great an expense for commercial development. In the Dorner process, however, the whole stalk is ground up, and it is claimed that the hard parts make no trouble in the later manufacturing stages.

LIME, familiar in building operations, is also of use to the dairyman, O. R. Overman, assistant professor of dairy chemistry at the University of Illinois, told members of the American Chemical Society meeting at Richmond, Va., in a symposium on lime and its chemical aspects. This use of lime has come with the development of dairying as an industry with a scientific basis. It has been found that when lime is added to cream used in butter-making, it neutralizes the acids formed, resulting in a greater yield of butter and increased keeping properties. Other members of the society told of the use of lime in the beet sugar, tanning and paper industries. The chief need of the industry itself is to make suitable lime at a profit, according to Professor J. R. Withrow, of the Ohio State University. The lime manufacturers give the best of their product to the building trades, and what is left to the chemists. As the building use of lime varies with the seasons, the result is a variable quality of lime reaching the chemists, and this damages the manufacturer in the eyes of the chemist.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE PROGRESS OF CHEMISTRY AND THE RICHMOND MEETING OF THE AMERICAN CHEMICAL SOCIETY

TELEGRAPHIC REPORTS BY DR. E. E. SLOSSON
Director, Science Service

THE American Chemical Society, holding its seventy-third session at Richmond, Va., from April 11 to 16, listened to over three hundred papers presenting the results of recent research. The program shows what unprecedented progress American chemical industry has made since the war freed the United States from dependence upon Europe. Our dyes and drugs are now mostly made in America, instead of being imported from Germany. A chemical congress has more personal interest for the public than the sessions of other scientific societies, because its proceedings, though expressed in technical terms quite as incomprehensible to the outside world, have more practical application to every-day affairs and business.

The principal event of the opening day was the dedication of the chemical building of the University of Richmond, which takes the place of the laboratory burned down last year. The new laboratory is absolutely fireproof and remarkably commodious and convenient for its cost, $150,000. It corresponds in style with the architectural plan of the Collegiate Gothic adopted when the college was moved in 1914 from its city site to the wooded campus in the suburbs.

Dr. E. Emmett Reid, of Johns Hopkins, a graduate of Richmond College, gave the dedicatory address, in which he said, "Laboratory methods are being adapted to many lines outside of the natural sciences, to psychology, to teaching, to social service, to advertising and to literature. As this progresses the differentiation of methods is increasing. There is an appropriate method for detecting and estimating each chemical element and likewise for each kind of force or radiation. Facts of a certain kind must be proved by appropriate experiments and can not be disproved by some other kind. Each realm has its own technique. We are becoming more and more sane in our search for truth: heated argument is giving way to patient investigation."

Dr. Charles H. Herty, a former president of the American Chemical Society and a graduate of the rival institution, the University of North Carolina, in speaking on the importance of research in industry, deplored the backwardness of the South in this field. He had counted up the contributions of the year to the two official journals of the society and found that out of 427 such research reports the thirteen states south of the Potomac were credited with only four or five per cent. Several of the Southern states had made no contributions to the science of chemistry in the period.

The vision of the chemists was carried to the verge of the invisible and beyond by the demonstration of the ultra-microscope by F. F. Lucas, of the Bell Telephone Laboratories. Pictures of thin sections of alloys thrown upon the screen showed the details of the various constituents and disclosed the causes of the strength or weakness of the metal. An incipient crack started in the edge of a strip of nearly pure iron by thousands of bendings was seen to have followed the line of the scattered inclusions of non-metallic material. By means of this instrument it is possible to make visible a particle of only one five millionth of an inch across, and by the use of the shorter waves of ultra-violet light the magnification and definition can be carried considerably further. Photographed in the dark, the particles so made perceptible are composed of only about five hundred atoms; so the microscopist must have nearly reached the chemist's limit of divisibility.

But the speaker who followed, Professor Victor Henri, of the University of Zurich, went beyond this point, and by the employment of X-rays and analytical mathematics, he demonstrated the arrangement in space of the five atoms forming the fundamental compound of carbon, methane. It has hitherto been surmised that the carbon atom occupied a position in the center, with the four hydrogen atoms around it at equal distances, but according to the new theory the shape of the molecule is a pyramid instead of a tetrahedron. The determination of the structure of the carbon atom is of primary importance, since all living matter, plant and animal, is composed of carbon compounds.

Buttering the plant's bread on both sides is the possibility held out by the experiments reported by Dr. V. N. Morris, of the government's fixed nitrogen research laboratory at Washington. One of the problems of making use of the nitrogen captured out of the free air, where vast quantities of this potential fertilizer are always hanging around unutilized, has been to get it reduced to a stable and solid form that can be tied up in bags and scattered with a shovel. Dr. Morris has tried passing various oxides of nitrogen through a milky suspension of finely ground phosphate rock, itself a fertilizer material, in water or weak acid. The reaction yields calcium nitrate and a soluble form of phosphorus. Since plants need nitrogen, calcium and phosphorus, this promises to be the basis of a triple high-grade fertilizer.

The query, "Have you had your iron to-day?" may soon have to be extended to, "Have you had your copper, manganese, nickel, cobalt and zinc?" For all these metals, as well as a few others, have been found in living plant and animal tissues by Dr. J. S. McHargue, of the Kentucky Agricultural Experiment Station, and seem to be necessary for normal health. Deprived of the last traces of copper and manganese, for instance, plants get most woefully yellow and sickly-looking. Dr. McHargue claimed for the metallic traces in Kentucky's limestone soil some of the credit for the fine pasturage of the blue-grass region and for the magnificent animals that graze thereon.

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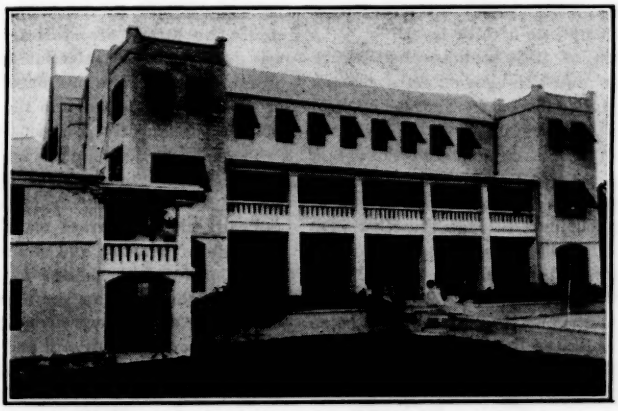

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The chemist is always striding ahead of the inventor and the manufacturer, challenging them with promising and provocative things for which uses must be found. His latest challenge is pure metallic vanadium. Beads of this bright, steely stuff were shown by J. W. Marden and M. N. Rich, research scientists of the Westinghouse Lamp Company. The element has been known in its compounds for many years, but these two men are the first who have been able to get it pure. They mixed the vanadic oxide ore with metallic calcium and calcium chloride and heated the mixture at about 1,500 degrees Fahrenheit in an electric furnace. Vanadium is a soft, malleable metal, easily drawn into wire and workable into other shapes. There is at present no known use for it; therein lies its interest. Tungsten, that now lights our houses, runs our radio sets and hardens our high-speed steels, was not long ago another such useless curiosity, dumped out of the crucible of the chemist at the feet of the world, with the question, "What are you going to do with it?"

The automobile is responsible for the rapidly expanding demand for rubber, which has multiplied its price and made it an international problem. At this meeting of American chemists attention was concentrated upon methods of reducing the rate of abrasion of tires and of preventing their deterioration through aging by oxidation. A new application of rubber has now approached the point of practicality; a method which has been developed simultaneously in Hungary and the United States for depositing rubber on metal by a process of electroplating from the latex. The little globules of caoutchouc suspended in the milk of the rubber tree are charged with negative electricity and when an electric current is passed through the liquid they are carried to the anode and there left as a thin adherent film, which may, by means of a recent invention, be built up into a thick layer.

A possible explanation of why medicine bottles are labeled "keep in a dark place" hinges on researches on the effects of polarized light reported by Professor David I. Macht, of the Johns Hopkins University. Polarized light is ordinary light that has been passed through a sort of crystal filter, or else reflected from a mirror surface at a particular angle, so that its waves no longer vibrate in all directions, but dart through the ether with all their fronts parallel. Polarized light occurs frequently as moonlight and as part of daylight, especially in early morning and late afternoon. Following the pioneer work of Miss Elizabeth Semmens, an English scientist, who produced evidence that polarized light starts the breaking down of starch grains, Professor Macht tried the effects of these rays on several important drugs, such as digitalis, cocain, quinin and atropin. In most cases the effect was to reduce the activity or even produce a deterioration of the drug. This weakening amounted in some instances to as much as twenty per cent. These findings, in Professor Macht's opinion, are of great importance both to chemists and pharmacologists.

A chemical theory of the origin of species was presented in a paper prepared by Dr. Victor C. Vaughan, formerly head of the Medical School of the University of Michigan, and a foremost authority on epidemics. He goes far back beyond Darwin to a period long before the appearance of the earliest and simplest single-celled plant or animal, which is the point where the biologist begins. For he believes that life is molecular and not cellular. The microscope shows us that cells constitute the structural units of all plants and animals, but Dr. Vaughan thinks that the size and shape of these little bags of protoplasm are less important than the composition of their contents. The essential and probably the primary compound of all living matter is protein, which consists of very complex molecules, containing various ammonia, acid and sugar groups.

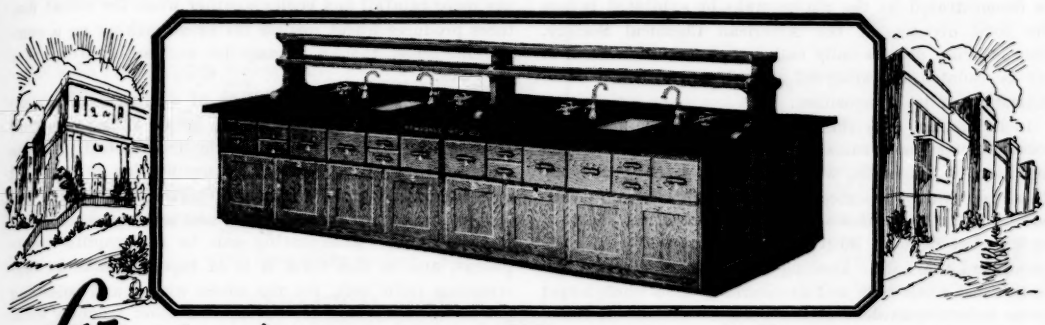
Dr. Vaughan admits that "up to the present time no chemist has awakened dead matter into life. It may be that this will never be done," but that should not discourage future experimentation in this line. Every element that is found in living matter exists in the mineral kingdom, and the chemist has learned that he can now make out of the inorganic material of earth and air many organic compounds formerly found only in plants and animals. As this gap between the inorganic and organic is being gradually filled in by modern research, so also is the gap between chemical molecules and living creatures. As he says, "Nearly twenty years ago I first stated my belief that life is fundamentally chemical and may, indeed probably does, exist in simpler and less tangible forms than any living cell, or even living bacterium." This opinion has since been confirmed by the discovery of minuter forms that prey upon the bacteria as the bacteria prey upon us, and by the study of the viruses of plant diseases, which are composed of particles so small as to pass through a porcelain filter, yet grow and multiply like living creatures.

The proteins are very changeable compounds and can be easily altered by disease or chemical action. For instance, an attack of measles in childhood may make a man immune to the infection for life. A minute amount of foreign protein, even from a wholesome food like eggs or milk, when injected into the blood renders this article of diet permanently poisonous to that particular person.

The importance of this paper extends beyond the sphere of chemistry into the domain of sociology and ethics. For if Dr. Vaughan's views are confirmed they must radically change current teaching as to the relative importance of heredity and environment.

"I hold that the lowest forms of life have come into existence through chemical agencies," Dr. Vaughan concluded, "And that environment has been a stronger factor in the evolution of life and in the development of the varieties and species than is believed by the biologist of to-day. All life is protein and the development of new species is due to molecular rearrangement in the structure of the protein molecule. Where a protein has at last been evolved which best fits the functional needs and where its environment remains little changed, its chemical constitution will remain remarkably constant."

How to extend the duration of the period of the prime of life is the question which Professor H. C. Sherman, of Columbia University, is endeavoring to answer by the feeding of thousands of white rats. That the secret of longevity is largely dependent upon an abundant supply



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of an unidentified chemical ingredient of certain foods he demonstrated by the photographs he exhibited before the food division of the American Chemical Society. This is being provisionally called "vitamin A," until it can be isolated and analyzed and given a chemical name indicative of its composition.

It is written, man shall not live by bread alone; the reason being that grains do not suffice for the normal nutrition of mammals, whether rats or humans. Their deficiency is supplemented by milk which is rich in vitamin A. But, as Professor Sherman showed, the value of such a diet depends largely upon the proportion of the bread and the milk. Feeding rats on a mixture of one sixth dried whole milk and five sixths ground whole wheat —the rodent equivalent of bread and milk—it was found that they grew normally, lived healthily and reproduced sufficiently generation after generation. But when he raised the ratio of the milk and made the dietary one third milk and two thirds wheat, the rats throve better, reproduced more rapidly and lived twice as long. Increasing the proportion of milk added more lime and vitamin A to the ration. This contradicts the old adage, "enough's a-plenty." More than enough is better, when vitamins are in question. Another noteworthy point is that the rats getting the barely adequate allowance of vitamin A were apt to become infected with a disease of the lungs in early adult life, which is the same period when young men and women are apt to succumb to pulmonary tuberculosis. It is already apparent that chemistry is beginning to invade various fields of sociology and throw light on many of the mysteries of history.

The liver, especially in young animals, is the storage place for most of the body's reserves of growth-promoting vitamin, and also is rich in manganese and some of the other mineral elements which appear to be necessary, though in minute amounts, for the maintenance of good health. Dr. Sherman expressed the wish that a way might be found to raise livers without having to raise all the animals that surround them.

Babies who have to be fed on evaporated milk in out-of-the-way places where fresh milk is a rarity are not so badly off after all, according to Professor Frank E. Rice, of North Carolina State College. Milk is swallowed as a liquid, but, he explained, part of it turns into solid curds on reaching the stomach; and cow's milk forms large lumpy ones that are all right for calves, but very difficult for infants. Mother's milk forms small, grainy curds that are easily digested, and evaporated milk acts very nearly like it. The fat globules in evaporated milk, also, are much smaller and hence more easily digested than are the fat globules of fresh milk. Aside from the obvious advantage of its cheapness, Professor Rice stated, it has the further desirable qualities of being easily diluted with water, and of not curdling when mixed with acid fruit juices.

The best flour for the big bread batches of modern bakeries is made from wheat that has known a little hardship, said Professor C. O. Swanson, of the Kansas State Agricultural College. "Strong wheats are usually grown on heavier soils and in a comparatively dry climate which has fairly hot weather during the later stages of the crop's development," he continued. "A climate which has more rainfall and cooler weather when the wheat matures produces wheat weaker for bread-making on a commercial scale, though it may be well suited for other purposes."

Live wires, attired in ribbons of synthetic silk, were introduced to the chemists by Dr. W. O. Mitscherling, of Bridgeport, Conn. Viscose made from wood pulp is pulled into a ribbon and after purification is wrapped around the wire while still wet. There it sticks tight and shrinks, making a very close fit, and serving as an excellent insulator. The coating can be made quite transparent, and in this form it is of especial value in constructing radio sets, for the whole wiring and soldering job can be inspected for breaks and other troubles without unwrapping or scraping anything.

A metal that takes fire when breathed upon was one of the novelties exhibited recently. It is barium, an element similar to calcium, not uncommon in minerals but now for the first time obtained in pure form and large yields by a process discovered by Professor R. A. Baker and A. J. King, of Syracuse University. They distil off the metal in a vacuum from a mixture of aluminum and barium oxide and get barium 99.95 per cent. pure. It is a soft and shining metal, somewhat resembling sodium. It is an extremely active and avaricious element, attacking with violence almost every substance brought into contact with it. Moist air sets it aflame. It can only be handled in glass tubes filled with argon, a gas so inert that it unites with nothing. On account of the avidity of barium for the gases of the air it may be useful in removing the last traces of air from vacuum tubes made for electric lamps and radio receivers.

Furs do not naturally follow the fashions, consequently the chemist has to be called in to change tint or pattern to correspond with the style of fabric that milady wants to wear. According to William E. Austin, the present rapidly expanding demand for furs is largely due to the fact that chemistry can now make furs to suit. Of the hundred million skins used in the United States annually the majority have been given chemical baths. More than half of them are rabbit skins which can be obtained in unlimited quantity and take varied dyes and designs. The once despised muskrat enters fashionable circles after being given a bath of aniline black and renamed "Hudson seal." It often happens that the imitation fur becomes more popular than the natural model. Even white ermine, fur of kings, and sable, king of furs, are enhanced in value by chemical treatment. By new bleaching processes it is possible to make a black skin white, so it can be given any desired coloration.

We may some day be able to recognize passing smells as we can now recognize passing autos, by reading off their numbers. E. C. Crocker and L. F. Henderson, of Cambridge, Mass., have worked out a system of tagging odors. They recognize four basic types of smell-perception: "sweet," "acid," "burnt" and "capryllic." Almost no scents belong wholly to any one of these classes, and most of them include all four in varying degrees. With a series of numbers from 0 to 9 to represent intensities, every scent can be designated.

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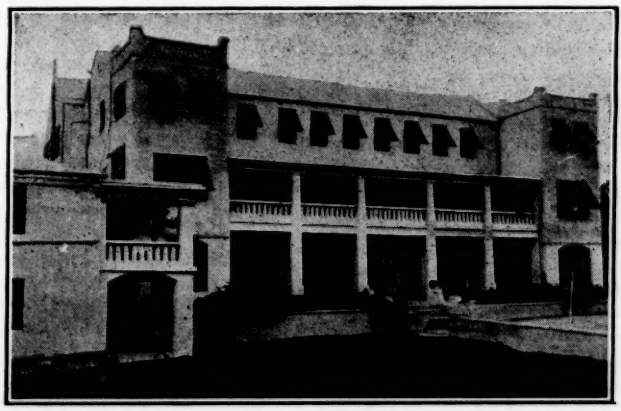

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SCIENCE NEWS

Science Service, Washington, D. C.

A NEW VALUE OF THE GRAVITY CONSTANT

ASTRONOMERS calculate a little more accurately with how much force the earth and the moon pull on each other by gravity; or physicists the force with which their bodies would be pulled to the earth if they fell out of a second-story window. This can now be done by means of the new value of what scientists call the "gravitational constant" announced at the meeting of the American Physical Society by Dr. Paul R. Heyl, of the U. S. Bureau of Standards.

As a result of three years' work, much of which was done in a subterranean chamber at the Bureau of Standards, Dr. Heyl has found this constant to be expressed by the fraction 6.664 over 100,000,000. The law of gravitation, stated many years ago by Sir Isaac Newton, says that two masses of matter attract each other by a force which is greater as they are more massive, and less as the distance between them becomes greater. The exact force is found mathematically by multiplying the masses of the two bodies by each other, and dividing by the distance, and then multiplying the result by the gravitational constant. As exact knowledge of the force of gravity is important in many different branches of science, all the way from study of projectiles fired from guns to study of the motions of the stars, the gravitational constant, which the physicist calls G, must be known very precisely.

About 1740 a Frenchman, named Pierre Bouguer, made the first attempt to measure G by experiment, but the first determination of value was made a quarter of a century later by an English astronomer, Nevil Maskelyne. His method was to observe a plumb bob on two sides of a mountain. The mass of the mountain tended to pull the bob towards it, and by measuring the deflection of the plumb line from exact vertical by comparisons with the positions of the stars and knowing roughly the mass of the mountain, a value could be obtained. It was not very accurate, however, because the mass of the mountain could not be more than guessed at.

At the end of the eighteenth century, another English scientist, Henry Cavendish, used the method now employed by Dr. Heyl for the first time. By this system, two tiny masses are attached to the end of a rod, which is balanced at the end of a long wire. Two heavy spheres of lead near the ends of the rod pull on the little masses and twist the wire slightly. This twist can be measured by a little mirror attached to the wire. A spot of light may be reflected by this mirror across the room, and a slight twist will produce a much larger motion of the spot of light.

Essentially, this was the same method that Dr. Heyl has employed, but with the aid of all the improvements to be offered by a modern research laboratory. Previous to this, the most accurate results had been obtained by Professor C. V. Boys, another Englishman, and an Austrian priest, Father K. Braun, who worked independently, each in his own country, about 1895. They both obtained the same result, with G equalling 6.66 divided by a hundred million.

In 1901, Dr. G. K. Burgess, now the director of the Bureau of Standards, in working for his doctor's degree at the Sorbonne, Paris, tried the experiment, and obtained 6.64 instead of 6.66, but as this was done under pressure of time, it was not very accurate. Dr. Burgess realized this, and when be became director of the bureau he saw to it that the experiment was performed more accurately than had ever been done before. This Dr. Heyl has now completed, confirming, as far as they went, the results of Professor Boys and Father Braun, and carrying the value to another decimal place in accuracy.

INAUDIBLE SOUND WAVES

FURTHER experiments on waves of sound of such high frequency that they can not be heard, though they are capable of killing small animals and of breaking down the corpuscles of blood, have been made by Professor R. W. Wood, of the Johns Hopkins University, and A. L. Loomis, of Tuxedo Park, N. Y., at the latter's private laboratory, and were reported before the annual meeting of the National Academy of Sciences.

These rays of inaudible sound waves are produced from slices of quartz crystal, driven by oscillating electric currents of frequencies of about 500,000 a second. They travel through any liquid or soil object and heat it as they go, but do not come out into the air. Blood corpuscles in a physiological salt solution are broken down, tinging the whole body of the fluid a clear red; but if a tiny particle of gelatin—half a per cent. or less—is added the corpuscles are protected and are not broken.

If a block of artificially frozen ice is subjected to their action, the waves have no apparent effect on it until it is placed under pressure, when it at once breaks into a mass of tiny crystals. But a piece of pond ice, frozen under different conditions, resisted the waves and did not crumble. Professor Wood has no explanation to offer as yet for this difference in behavior. Finely powdered solids stirred up in water to make a suspension are driven together by the waves until they form a closely packed round mass just under the surface.

Things that can not ordinarily be mixed with water, like oil, paraffin and mercury, are forced by the vibrations to become exceedingly fine suspensions or emulsions. A paraffin candle was floated on water and the current turned on. The wax melted from the surface and came down into the liquid in the form of a cloud of microscopic white drops, forming a veritable paraffin milk that could not be distinguished in appearance from real milk. In another experiment, a little mercury was poured on the bottom of the beaker full of water. The waves broke it

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up into drops so small that they could just be seen with the highest power of the microscope, scattered evenly through the water in a dense cloud. This mercury-water emulsion was as black as ink. Professor Wood believes that a possible future application of this newly discovered power of these waves may be to create emulsions out of combinations of liquids that can not be forced to mix in any other way.

RADIO MEASUREMENTS

RADIO measurements are now made a thousand times as accurately as four years ago. Where in 1923 radio engineers made their measurements to an accuracy of 1 per cent., they now go to a thousandth of a per cent., according to a paper given by Dr. J. H. Dellinger, in charge of the radio laboratory of the U. S. Bureau of Standards, at the meeting of the American section of the International Union of Scientific Radio Telegraphy.

Part of this increased accuracy has been due to the use of the piezo-electric oscillator. With this device, a small crystal of quartz, between two metallic electrodes, can control the wave length of a broadcasting station to a considerable degree of accuracy. However, Dr. Dellinger stated that the use of the crystal by no means dispenses with careful adjustments. By the use of the crystal oscillator it is easily possible to obtain an accuracy of a tenth of a per cent., but for a higher degree of accuracy all the conditions, such as the temperature of the crystal, must be carefully controlled.

If American and Canadian broadcasting stations do not keep to their proper wavelengths, it will not be for the lack of accurate standards, for Dr. Dellinger told of comparisons made by the Bureau of Standards with the Canadian radio authorities. One of the bureau's standard crystal oscillators has been sent to Canada for comparison with their standards, and it has been found that the two agree to within a hundredth of one per cent.

M. S. Strock, also of the bureau, told of its work in disseminating standard frequencies of radio waves. One way of doing this is by calibrating meters sent in by outside agencies with the bureau's standards, but the most effective way is by the use of the transmitting stations themselves. "The basis of this scheme," he said, "depends upon the fact that a standard of radio frequency may, neglecting the effects of interference, be transmitted over great distances and reproduced at the receiving station with an accuracy equal to that of the transmitter."

This method is used by sending out regularly standard frequency signals from the Bureau's station WWV. Careful check is kept also of the frequency of a selected list of stations near enough to Washington to be received directly at the bureau. There are thirteen of these standard frequency stations, and in addition, a list of "constant frequency" stations, which includes about 5 per cent. of the stations of the country, are checked a little less carefully. Standard frequency signals have been broadcast from 6XBM, at Stanford University, California; 1XM, at the Massachusetts Institute of Technology, and 9XL, of the Gold Medal Flour Company, near Minneapolis.

FOSSIL-BEARING ROCKS OF THE GRAND CANYON

THE fossil-bearing rocks of the Grand Canyon, which have recently aroused much interest because of the discovery in them of footprints of long-extinct animals, are now yielding remains of the leaves and stems of plants among which these animals roamed and fed, many millions of years ago. At the meeting of the National Academy of Sciences, Dr. David White, of the U. S. Geological Survey, told of his examination and identification of many specimens from this region.

The plants that grew on the ancient floodplain of red sand through which the great gash of the Grand Canyon has since been cut were very little like the ones that grow in the forests of to-day. Their nearest relatives still living are the ferns and tropical cycads and similar plants.

The plant remains were all preserved by being deposited at the bottoms of streams or ponds, but there is evidence that these bodies of water were not permanent, but appeared during rainy seasons and dried up when the rains ceased, just as most of the streams and ponds in the arid Southwest do to this day. Pressed between thin layers of water-deposited sand that gradually hardened into strata of sandstone, the leaf and stem fragments were preserved like botanical specimens in a huge book, and even after their own substance had gradually decayed and almost wholly vanished, their imprints were left on the stone just as the print of a pressed flower is sometimes left between the pages of an old volume, shelved many years ago and never opened.

The knowledge gained of the ancient animals of the Grand Canyon region was summarized and brought down to date by Dr. Charles W. Gilmore, of the U. S. National Museum. Footprints of extinct reptiles and amphibians have been found in three distinct formations. These are known respectively as the Coconino, Hermit and Supai formations. Thirty-three species were represented by tracks in these three levels, 22 species in the Coconino, 8 in the Hermit formation, which also yielded all the plant fossils studied by Dr. White, and 3 species of animals in the Supai. Remains of insects were found for the first time in the Hermit formation. More than two tons of stone slabs bearing fossil footprints are now in the U. S. National Museum.

STEAM WELLS

BORING for live steam as men bore for oil, with the possibilities of running engines and turning dynamos without the burning of a pound of fuel, was described before the meeting of the National Academy of Sciences by Dr. Arthur L. Day, of the Carnegie Institution of Washington. The steam wells described by Dr. Day are in Sonoma County, Calif., where operations have been going on for some time to exploit a field of hot springs and steam vents similar to those of Yellowstone National Park, but on a smaller scale.

So far five borings have been sunk. They reach depths of from 300 to 600 feet, yielding a total of nearly 5,000 horsepower of live steam. The temperatures at the bottoms of the wells vary from 160 to 185 degrees, and the

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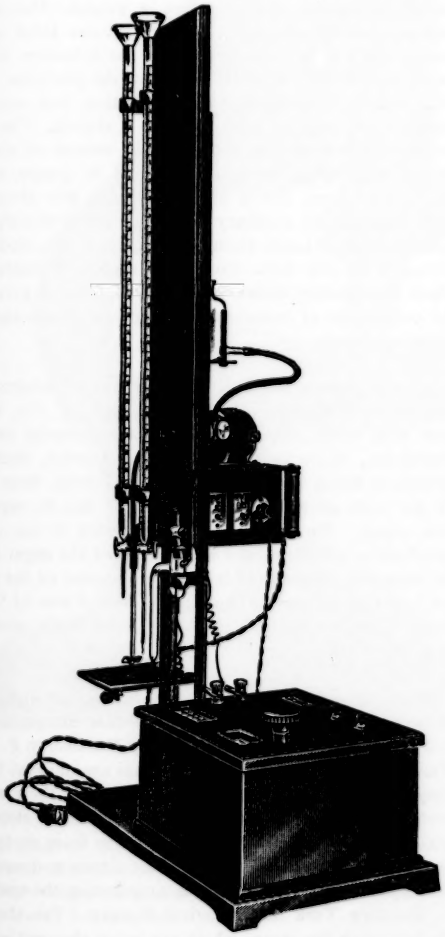

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pressures attain a maximum of 276 pounds per square inch. Besides steam, various gases come out of the wells, making up less than two per cent. by volume of the product.

Similar wells have been operated on a large scale for several years in Italy. Concerning these, Dr. Day remarked, "Compared with the development of natural steam in Tuscany, where more than 30,000 H.P. is now commercially developed, the conditions in California appear to be somewhat more favorable from the point of view of the uncondensable gases carried and their corrosive effect upon metals. The total power available is probably smaller. The oldest of the California wells has now been flowing intermittently for five years with undiminished pressure."

VANADIUM

THE addition of a new metal, vanadium, to the world's resources, is announced by J. W. Marden and M. N. Rich, research scientists of the Westinghouse Lamp Company.

Vanadium has been known in its compounds for a long time, according to Dr. Marden and Dr. Rich, but in spite of a century of efforts on the part of chemists no one has previously been able to produce it in its pure form. The method employed by the authors is to heat a mixture of vanadic oxide, metallic calcium and calcium chloride in an electric furnace for an hour at a temperature of nearly 1,400 degrees Fahrenheit. After cooling and stirring the resulting mass in cold water, metallic vanadium is obtained in the form of beads.

"The beads of vanadium are very bright, have a steel-white color and are quite malleable, soft and ductile," say the authors. "They can be melted in a vacuum in a high-frequency induction furnace, rolled into wire and worked up into other shapes. As far as analysis can determine, they are 99.9 per cent. pure metal.

"There is no known use for this new metal at present, but undoubtedly it will have special properties that will make it useful. Tungsten, for example, was once a useless metal, but is now of inestimable value for filaments in incandescent lamps, for high-speed tool steel alloys and many other purposes. Vanadium may, in time, prove equally serviceable."

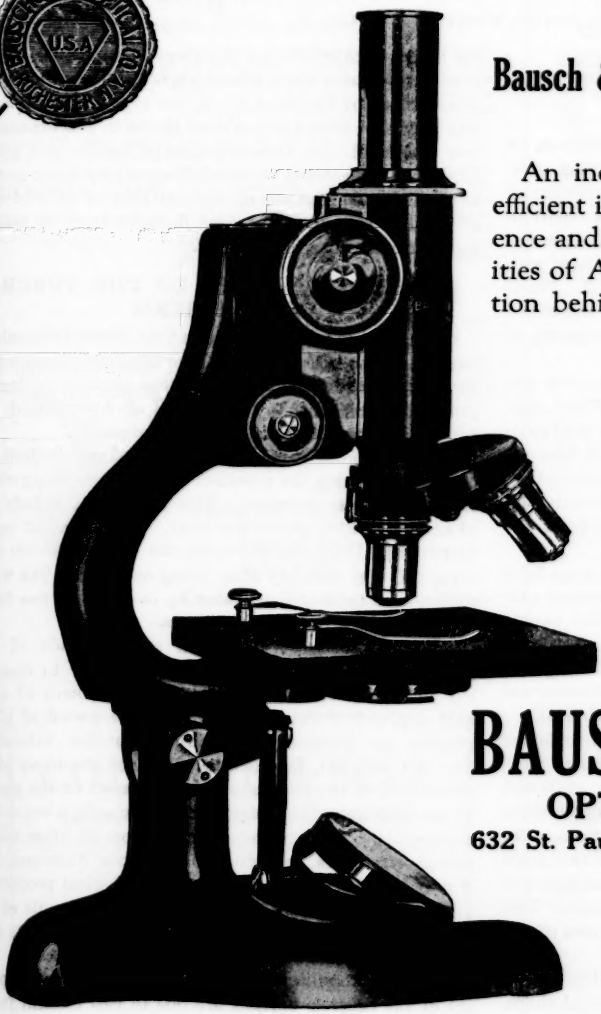
ITEMS

USING an electrical heat-measuring device so incredibly delicate that it is sensitive to two trillionths of an ampere of current and will measure temperature changes of as little as one ten millionth of a degree Centigrade, Dr. A. V. Hill, of Cornell University, has measured the temperature changes in nerve fibers during their activity. In describing his experiments before the National Academy of Sciences, he stated that his object had been to learn more about the nature of nervous action. Older theories have held that nervous impulses were not like other physiological processes, but were physical waves like light or radio waves. These ideas were based on the absence of any detectable heat given off by nerves as a result of stimulation. But with the extremely sensitive instrument devised by Dr. Hill it is possible to measure the almost vanishingly minute temperature rise that occurs in a single nerve fiber when it is caused to react. The moment of activity of a nerve is followed by a prolonged period of recovery, during which nine times the initial amount of heat is given off.

THE loss in weight that we all undergo every day has been the object of research by Dr. Francis G. Benedict and Cornelia Gollay Benedict, of the Carnegie Institution of Washington, who reported their results at the recent meeting of the National Academy of Sciences. Two sensitive balances were used in the work. Both were strong enough to sustain the weight of a man, but sensitive enough to register small changes in weight. One of the balances would indicate a change of one third of an ounce, and was so constructed that the volunteer for the experiment could sleep all night on its platform. The other was a hundred times as sensitive, but could be occupied for only an hour or so at a stretch. The total moisture losses of this class from a woman of average weight were found to average around 30 grams, or one ounce, per hour; for a man the figure was about one third higher. An auxiliary device permitted the separate measurement of losses from the lungs and skin, and these averaged 50 per cent. from each source of water loss. Other mechanisms measured the carbon dioxid given off, the percentage of water in the outgoing breath and also its temperature.

A NEW process for making sugar out of sawdust was described by Professor Erik Haegglund, of Abo, at the coal and wood chemistry conference recently held in Stockholm, where he reported that at Geneva, where the process is being tried on a commercial scale, from 65 to 70 per cent. of the sawdust by weight can be converted into sugar. For Sweden, where forestry is one of the dominating industries and where most of the sugar has to be imported, the method is likely to become of the greatest importance. Several hundred thousand tons of "wood sugar" can be produced annually from easily accessible raw materials.

BECAUSE it resembles a star twinkling at night more than any other precious stone, the blue zircon of Siam has been rechristened "Starlite" by Dr. George F. Kunz. These flashing blue stones from Siam are unusual in that they are never blue at all when found in their natural state, but are brown or reddish in hue. The stones are placed in a crucible and burned in a fire from six to eight hours exposed to a solution of cobalt nitrate and potassium ferrocyanide, said Dr. Kunz, in announcing the new name to the New York Mineralogical Society. The chemicals do not touch the stones which are being changed in color, but the fumes do the coloring. After cutting it is necessary to expose them again to the fire from five to twenty minutes. This is the most brilliant blue and green precious stone. The flash is more near that of the diamond of the same color and resembles the occasional sparks from copper contacts, especially when a trolley pole hits a wire. It also has the brilliancy and color of some stars.



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SCIENCE NEWS

Science Service, Washington, D. C.

FOSSIL IMPLEMENTS IN PLIOCENE DEPOSITS

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HAS Nebraska produced the most ancient evidence of the existence of man yet known to science? This question is raised by Dr. Henry Fairfield Osborn, president of the American Museum of Natural History, in a report to the American Philosophical Society in which he describes investigations conducted by him in collaboration with Albert Thomson, of the American Museum staff. Fossil bone implements in geologic strata have been unearthed that may be some 4,000,000 years old, an age known to geologists as Pliocene.

Since past opinion has been that the most ancient evidences of man were to be found in the Old World, and since claims of the discovery of man in America antedating the Indians, some 25,000 years ago, have been received heretofore with skepticism, the announcement of Dr. Osborn, one of the world's leading authorities on the antiquity and evolution of man, will create great scientific interest.

Over 300 implements of forty different types have been discovered. They are made of the bones of extinct animals that lived in Pliocene times, but time has caused them to be turned into stone. These are the first completely fossilized bones to be discovered. Among the animals whose bones are represented in the collection are extinct horses, camels, deer, elephants and mastodons.

The exact locality in which the discovery was made has not yet been announced with further detail than to state that it is in western Nebraska. Dr. Osborn explained that he desired to protect the site from curiosity seekers who might interfere with the scientific investigations. The first of these artifacts were discovered about two years ago and since that time tractors and other modern machinery have been used in excavating the area. Two localities about 75 feet apart have produced most of the implements.

The fossilized implements are described by Dr. Osborn as of undoubted human origin and of symmetrical shape. Among them are skin dressers for cleaning animal hides, pointed awl-like implements evidently used in sewing, neck ornaments made of strung bones and a kind of comb that seems to be a tattooing implement. Eighteen of the types of tools have been matched with counterparts found in the ruins of cliff dwellers of the arid regions of the Southwest and one type can be nearly duplicated by a much more recent implement from the shell heaps of eastern America. Dr. Osborn stated that the fossilized bone implements he has found are just as real artifacts of human handiwork as are the famous worked flints of Europe. But unlike the implements of Europe which are usually weapons and hunting tools, the Nebraska artifacts are nearly wholly related to the peaceful arts. Further investigations are to be carried on this summer.

The discovery of evidences of ancient man in Nebraska, the native state of William Jennings Bryan, recalls that a fossil tooth found there several years ago by Harold Cook was ascribed by Dr. Osborn to a new type of ancient man, who may have been the maker of the tools and ornaments now unearthed. Dr. Osborn's discoveries also lend added interest to the recently reported discovery by investigators at the Colorado Museum of Natural History of evidences of ancient man in Pleistocene deposits in three widely separated localities in the West.

CHEMICAL ANALYSIS OF THE TUBERCULOSIS GERM

CHEMICAL analysis of the germ that causes tuberculosis has led to the discovery of a new type of compound, a phosphorus-containing fat, which has peculiar biological properties, according to Professor R. J. Anderson, of the department of chemistry at Yale University.

The tuberculosis bacterium is unique among single-celled organisms in being the possessor of a waxy covering which renders it highly resistant. This is why it can defy the phagocytes which police the body, for instead of being dissolved by them and destroyed, the T. B. organism survives and may multiply after being engulfed. The waxy sheath is so thick that it makes up one fifth to two fifths of the weight of the dried bacteria.

Professor Anderson extracted eight pounds of the germs with a mixture of alcohol and ether to dissolve out this waxy coating. He obtained a pound of wax, half a pound of fat proper, and half a pound of phosphatide or phosphorus-containing, fat-like substance. The last material, to which he has given the name phosphosucride, is the most unusual constituent of the germs. It has been shown to contain phosphoric acid, a sugar and fatty acids. This compound differs from all other known phosphorized fats, according to Professor Anderson, and it may be expected to have peculiar biological properties.

While the biochemist is busy probing the formula of the phosphosucride, other investigators are studying it biologically at the Rockefeller Institute for Medical Research, to determine to what extent the destructive powers of the tubercle bacillus are due to this element in its make-up, and whether once identified, it will be of service in the treatment or prevention of the disease.

Other chemists in an analogous way have obtained specific chemical compounds from pneumonia bacteria, which show promise when applied clinically.

THE EUROPEAN FISH TAPEWORM

THE dangerous fish tapeworm of Europe, the largest of the parasites that commonly attack human beings, has become established in the United States, and is to be the object of special study this summer by a group of investigators backed by the National Research Council and under the immediate direction of Professor H. B. Ward, of the University of Illinois, foremost authority on internal parasites. They will go to the extreme northern part of Minnesota, which is the center of the

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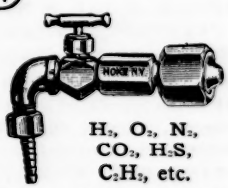

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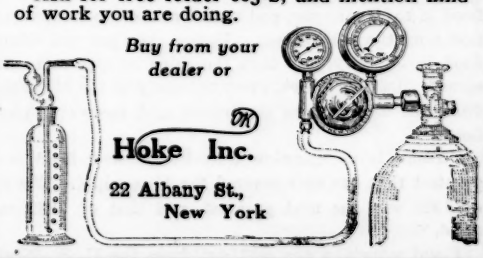

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threatened area in this country, and spend the summer tracing the connections of the infestation, which is complicated by the fact that the worms live part of their lives in fish and the rest in human beings and other warm-blooded creatures.

Fish tapeworms is a relatively common affliction among the peoples around the Baltic Sea, and is said to occur also to some extent in Switzerland. In some cases it does relatively little harm, while in others it induces an extreme condition of pernicious anemia, which sometimes ends in death.

Professor Ward states that the infestation was introduced by immigrant laborers in the iron and lumber industries, who not only carried the parasites internally but also imported their favorite dried and salt fish from the homelands. Salting does not kill the pest, and imperfect smoking also leaves it alive. There is evidence now, however, that the native fishes in some of the northern lakes may have become infested, and it is to ascertain the truth or falsity of these reports and to work out methods of keeping the infestation from spreading that the expedition under Professor Ward is to take the field this season.

THE MISSISSIPPI FLOOD AND FLOOD PREDICTIONS

THE greatest flood in Mississippi River history, now raging, gave the first grim warning of its approach eight months ago.

"The present flood began late in August when heavy rains set in, raising the waters of one or two rivers in Kansas and Oklahoma," according to the following statement by H. C. Frankenfield, head of the division of rivers and floods of the U. S. Weather Bureau.

"In October there was flood in the Arkansas and Neosho rivers with damage of $40,000,000, or perhaps more. Last fall, I saw mud clots on ten-foot corn stalks, out in the prairie. Then, the rains drifted eastward, over Missouri, Illinois, Ohio, Tennessee, Kentucky and the Cumberland. And all this was at a time of the year when the rivers of the Mississippi system should have normally been at their lowest level.

"We know then that if the rains of the coming winter and spring were much above normal, we were going to have a big flood. But we can not forecast rains, and of course we could not predict the volume of the present torrent.

"Late in December rains swept Tennessee and Kentucky, and the next report was that all records were broken in the Cumberland River and there was a high flood in the Tennessee, and these are the two largest tributaries of the Ohio River. Heavy rain put the Ohio in flood in January, and then the rains became more widespread. During March, every tributary of the Mississippi, from the Des Moines southward and eastward, was in flood.

"There is no question that the present flood is the greatest that has ever covered the Mississippi. The flood of 1922 was the next greatest, and that of 1882 ranks third."

Flood warnings are sent out from the U. S. Weather Bureau every day in the year to some parts of the United States, sometimes four weeks in advance, sometimes only 18 hours. The Mississippi flood waters gather from such distant streams and have been studied so long and carefully that height and speed of the spring flood in the lower Mississippi can usually be estimated by bulletins several weeks before it sweeps through Louisiana.

"The prediction of floods is perhaps the most exact forecasting that we do," said Dr. Charles F. Marvin, chief of the U. S. Weather Bureau. "The prediction side is far ahead of the prevention measures that can be taken."

The bureau's flood warnings are instantly heeded by the people of the region involved, even though the country at large hears very little about a flood until the water reaches an alarming state. Engineers and levee boards organize their workers and get out their equipment. The dykes are strengthened, inhabitants are notified. But along the lower Mississippi many thousands of the people are Negro farmers and laborers and their families, people who often stick to their homes and trustingly climb up to the rooftops when the river menaces them, rather than escape when warned.

Many of these river dwellers, even if they have escaped with their lives, have now seen their homes wrecked. They have lost their best chance to plant their cotton or other crops, and unless the weather favors them, they may fail to get a crop in at all.

So long as men try to hold the Mississippi and its contributing streams within narrow bounds, so long men will have to keep close watch on the flood hazard, according to Dr. Marvin. In past ages, the river handled the problem in its own way, and made huge drainage areas. But men have built over 2,000 miles of levees to guide the river within a convenient channel. The levees are supposed to stand the strain of the torrent and they hold up remarkably, but if the water seeps in through a small leak in the wall, the rift may grow and the flood may force its way through, as it did at Dayton in the famous flood of 1913. Even though the walls of the levees are built higher and higher, and though they are pushed back from the river bank, even two miles in some places, the river may in emergencies demand and take more room.

Several hundred dollars spent in a laboratory study of floods would prevent millions of dollars loss, John R. Freeman, former president of the American Society of Civil Engineers and the American Society of Mechanical Engineers, said recently in commenting on the floods.

"The Federal Government and the states have spent hundreds of millions of dollars in trying to solve the Mississippi's problems, but it is still possible for one break in a levee to lay waste 5,000 square miles of as fertile land as the sun shines on, with a loss of $25,000,000 almost overnight," said Mr. Freeman, who accompanied President Roosevelt on his official inspection of the completed Panama Canal in the capacity of expert adviser. He was also consulting engineer for the Chinese Government, and has studied flood and river problems in that country.

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INDIAN MOUNDS AS FLOOD REFUGES

THE thousands of terror-stricken people who have taken to Indian mounds to escape the flooding Mississippi waters are showing scientists how the Indians probably used these earthworks which they built in pre-Columbian days.

Each of these mounds, very frequent in this section, can take care of some 500 persons. Sturdily built of earth, they have resisted the onslaught of the waters for generations, and are now pinnacles of safety to the refugees.

The situation to-day, according to Dr. Alfred Kidder, the well-known American anthropologist, is strong evidence in favor of the theory that the mounds were originally built by the Indians a thousand years ago for this very purpose—to afford refuge from floods. Undoubtedly the Indians experienced floods of considerable magnitude and had to find some method of protecting themselves.

"In all probability," said Dr. Kidder, "it was for this purpose that they toiled for years to build these high mounds. It was a gigantic task since they had only their baskets in which to carry the tons of earth necessary to make them.

"It was at first thought that these mounds might be funeral piles like other smaller mounds in this section and in the Ohio valley, but excavations unearthed no human remains. However, post holes were discovered where the framework of buildings had evidently been erected. Baked clay was also discovered. This clay had plastered the log and twig structure of the building and was hardened into enduring form when the buildings caught fire.

"Were these mounds erected merely as high places for temples as in the case of the Aztec and Toltec pyramidal structures? was the conjecture. Against this theory arose the remote possibility that the mounds were places of refuge from floods—a theory substantiated by the present situation.

"The buildings were probably temples, altars and the habitats of chieftains," said Dr. Kidder. "In time of flood a mound could accommodate the entire tribe, most of the members of which probably lived in the inundated area."

Pyramidal in structure, but with a flat top to permit erection of buildings, the mounds are about 150 feet in diameter and some fifty feet high. They are largely confined to the flood area of the Mississippi. A number occur, however, in areas in the valley which are not completely inundated in flood time. These were probably built later, Dr. Kidder said, in the manner of primitive peoples, after the erection of such mounds had become a custom. The funeral mounds, on the other hand, are much smaller and lower and occur frequently in both the Mississippi and Ohio valleys.

ITEMS

A SCALY monster of the pre-human ages of the earth, surviving into modern times in the almost unvisited swampy fastnesses of southern Java, is reported to the scientific journal, *Die Umschau*, by Dr. P. Vageler. It is described as a one-horned rhinoceros, related to a form already known elsewhere in the East Indies, but differing from it in that its almost naked hide is closely covered with small, hard, horny scales. It also has enormous front teeth, like those of a hippopotamus. It has often been described by the natives, but Europeans were incredulous, regarding these reports as folklore. A few professional hunters among the whites had killed specimens; but they could obtain such high prices from the Chinese, who use the hide and horns of rhinoceroses in medicine, that they were secretive about the business and did not share their knowledge with scientists. Finally, however, photographs were brought out of the jungle, showing very clearly that the animal is new to science. Now that its existence has been authenticated it is expected that efforts will be made to secure living specimens for zoological gardens.

G. K. NOBLE and M. E. Jaeckle, of the American Museum of Natural History, confronted with the troublesome fact that frogs and toads and spotted salamanders and all manner of other interesting but non-fur-bearing creatures can not be successfully stuffed and mounted by the ordinary methods of taxidermists, have solved the problem by pickling them in solid paraffin wax. They first remove all trace of water from the specimens by appropriate chemical means, arrange the little animals in natural positions, and soak them for several days or weeks in melted paraffin, until every tissue is thoroughly impregnated. By this method reptiles and amphibians can be worked into naturalistic museum groups and made as "alive" looking as birds and fur-bearing animals, instead of being pallid corpses pickled in jars of alcohol. They keep their natural colors indefinitely, except that sometimes their eyes need to be touched up with a little gold paint.

A GERMAN artist-inventor has devised a new technique for turning plaster statues into metal ones, by means of an ingenious "extrusion pistol" which projects a fine stream of melted bronze or other metal against the inside of a hollow plaster cast with such force that it carries on through the porous substance and comes out as a thin film, hardening on the outer surface. The process is said to be rapid, five minutes' operation of the pistol being sufficient to metallize a plaster cast the size of a man's hand.

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SCIENCE NEWS

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LIVER EXTRACT FOR PERNICIOUS ANEMIA

BEEF liver may be the means by which science will eventually succeed in finding a cure for pernicious anemia, a disease that almost invariably terminates in death. Scientists at Harvard University have established that a diet rich in liver promptly increases the number of red blood corpuscles in patients with this disease and they are now endeavoring to isolate the active principle in liver. Lack of this principle apparently prevents patients with pernicious anemia from manufacturing red blood cells.

Last year Drs. George R. Minot and William P. Murphy, of the Collis P. Huntington Memorial Hospital of Harvard University and the Peter Bent Brigham Hospital, reported the successful treatment of patients with a diet containing large amounts of liver. Over 50 patients have now been successfully treated for from 1 to 3 years with a diet containing approximately 200 grams of liver a day. Even though the individual with pernicious anemia knows that he is the gainer thereby, a daily diet of liver in the quantities necessary to replenish the blood with red corpuscles is difficult to take for a long time. Consequently, a small dose of liver extract daily, that does as much good as 200 grams or more of the whole liver, represents a big advance in the treatment of this disease. The causes of this fairly common malady are unknown, though it is believed by some that a predisposition toward it is inheritable. This disease should not be confused with anemia due to common causes.

Dr. E. J. Cohn and his collaborators in the department of physical chemistry in the Harvard Medical School have isolated a non-protein-, non-fat-containing fraction of liver that promptly produces young red blood cells, and permits the total number of red blood cells to increase. Drs. Minot and Murphy are determining the effectiveness and the clinical uses of the successively purified extracts that are being prepared.

The most concentrated preparation that has thus far been administered produced about four times its weight of erythrocytes, or red blood cells, within a fortnight. An effective daily dose amounts to about one third of an ounce, or 10 grams. Nine patients with pernicious anemia have been fed the extract with entire success during the past months.

The chemists are still uncertain as to the exact amount of the effective substance in the liver extract, since, despite the fact that the purification has proceeded far, a large part of the material in the present mixture may eventually prove to be inert. After further purification it may be possible to isolate the chemical substance, or substances, that are specifically involved, and thereby learn more of the reactions and of the physiological mechanisms that are disturbed in this disease.

The development of the use of liver extract in the treatment of pernicious anemia may be as important in its way as the outstanding achievement in the treatment of diabetes three years ago by the use of insulin, an extract of a particular part of the pancreas. Physicians and scientists are watching the clinical trials of the Harvard liver extract with great interest. Further reports of the treatments are to be made at the coming meeting of the American Medical Association in Washington beginning on May 16.

THYROID EXTRACT AND CATARACTS OF THE EYE

THE much-discussed thyroid gland has a new use. Drs. William J. Kerr, George N. Hosford and H. C. Shepherdson, of the University of California, have found that several of their cases of cataracts in elderly people have improved vision after the administration of thyroid extract.

Senile cataracts are thought to occur in individuals in whom a general break-down of the body forces is under way and consequently any agent, such as thyroid substance, that tones up the whole system, is likely to be helpful in improving the impaired vision. The doctors are careful to state that cataracts may remain stationary for years and even clear up upon occasion without treatment, thereby making it difficult to prove the actual value of any curative procedure that may be undertaken. They have, however, obtained such good results from this method that it may develop into a new weapon of attack against this insidious form of blindness.

The general condition of the patient should be carefully studied, says Dr. Kerr, and it is well for the practitioner or internist to cooperate with the ophthalmologist while the extract is being given. "There is no great danger in the administration of thyroid substance, if the patients are carefully studied before treatment and watched for toxic symptoms."

"When the metabolism of cholesterol is better understood we may find a relationship between it and formation of cataract in the senile as well as the diabetic patient. Further studies are needed on the metabolism of sodium, potassium, magnesium and calcium in relation to the changes in the lens in senile cataract."

ANIMAL TISSUE AFTER DEATH

IMMUNITY to disturbing disease invasions from the outside does not need to end with the death of the animal that possesses it, but will live on in a part of its tissues if these can be kept alive by artificial means. Dr. William Bloom, of Chicago, Ill., describes, in the *Archives of Pathology*, an ingenious experiment in which he showed that bits of a rabbit's lung, kept growing in a glass vessel after the rabbit's death, were still able to kill off disturbing elements against which the rabbit had been rendered immune during its lifetime.

In his research, Dr. Bloom substituted alien red blood cells, taken from a pigeon, for disease germs. He was able to do this because the blood of any animal will react toward many outside substances, especially proteins, very

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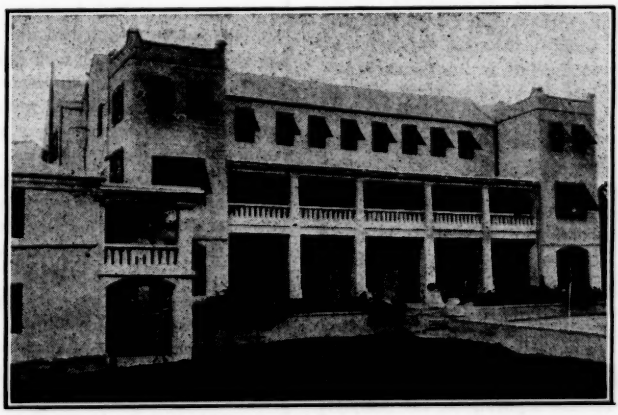

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much as though they were hostile germs. He made the rabbit immune to the injection of these blood corpuscles by suitable physiological treatment. Further injections of pigeon blood corpuscles had no effect on the rabbit; they were simply destroyed by the white cells in its blood. Then the rabbit was killed, and a bit of its lung kept going as a tissue culture. Pigeon's blood was placed upon it, and the conduct of the white blood cells in the culture watched through the microscope. These minute "policemen of the blood" acted as though they were still in the living animal, seizing upon the alien corpuscles and devouring them.

As a further test, a tissue culture was made from the lung of another rabbit which had not been immunized. When pigeon's blood was added, its white cells did nothing. But when a little blood serum from the immunized rabbit was added, there seemed to be something in it that stimulated the white cells to action, for they then eagerly went after the pigeon corpuscles and soon destroyed them.

THE CHEMISTRY OF LIFE PROCESSES

CHEMISTRY on a factory scale, using tons of raw material where the investigator has hitherto used pounds or ounces, offers the most promising line of attack on some of the stubborn secrets of living animals and plants. This was one of the theses advanced recently by Professor Lafayette B. Mendel, of Yale University, in an address upon the occasion of his presentation with the American Institute of Chemists' Medal, in recognition of his brilliant work on the chemistry of life processes.

Professor Mendel said, in part: "The inorganic chemist has long realized that the identification of the radioactive elements resulted only through the use of tons of ores in which they are hidden away. It remained for the biochemists, often engaged without success in studying the nature of the potent iodine-containing substance of the thyroid gland, to observe Kendall, in this country, and Harrington, in England, apply the processes of separation and purification to hundreds of pounds—not a few grams or kilograms—of animal tissue before the worthwhile discoveries regarding thyroxin were made. Willstätter's classic researches on chlorophyll called for the use of enormous amounts of green leaves. The quest of the antirachitic vitamine—vitamine D—has already involved the saponification of a few tons of cod-liver oil without as yet yielding in a state of requisite purity sufficient of the potent factor to establish its actual chemical nature beyond question. The epinephrin of the adrenal medulla remained elusive until it was prepared in adequate amounts for critical study. Unless a wealth of pancreatic gland is made available for the separations, the complete story of the chemistry of insulin is not likely to be written. The chemistry of both animal and plant cells—materials rich in unknown numbers of unidentified substances, some of which are presumably of large biological significance—awaits the employment of factory-like operations affording better opportunities to attempt the difficult separations of unrecognized compounds."

Professor Mendel also expressed some concern over the present highly optimistic popular feeling toward the possibilities of science. Before the war, he said, chemists complained, with cause, of the indifference of peoples and governments. After seeing what could be made of applied chemical knowledge, public opinion has swung to the opposite extreme, and now confidently expects a chemist to retire to his laboratory and prepare wonder-working new compounds to order as easily as an engineer plants and erects a skyscraper. In order to forestall another reversal of the pendulum, the people should be informed concerning the obstacles confronting the investigator, as well as his own human limitations, quite as freely as they are now told of the remarkable possibilities that may come from the laboratory test-tube and the factory retort.

EXTREME TEMPERATURES

DAYS are coming when we shall enjoy thinking of the coldest spot on earth. That imaginary comfort may be enhanced by a knowledge of the exact time and location of the coldest known temperature. Verkhoyansk, Siberia, just within the Arctic Circle, experienced 90.4 degrees below zero Fahrenheit on January 15, 1885. It was unofficially reported that this same place recently broke the above record with 97.6 degrees below.

However, do not start for Verkhoyansk, for your vacation, for the temperature rises to 80 degrees during the two-month summer. Miles City, Montana, holds the low record for the United States, with 65 degrees below.

It may help the fellow who must enjoy the sea breeze of an electric fan to know of a hotter spot than his own chair. The Italian meteorological station of Azizia registered 136.4 degrees Fahrenheit, in the shade, on September 13, 1922. Azizia is in the semi-desert plain of Jefara, northern Africa. The mean annual temperature for this region is 70.8 degrees.

Before Azizia established her hottest day, California's similar arid inland plain held the world's record with 134 degrees in the shade. This was at Greenland Ranch, on the edge of Death Valley, where the thermometer goes higher than 120 degrees every summer. Officials at the weather bureau question Azizia's record because the conditions under which the 136.4 degrees were obtained were not certainly proper. However, this may be the American desire for bigger and better climate, as Professor Filippo Eredia saw to the establishment of the meteorological station at the Italian settlement in 1913 and took great pains to insure the accurate functioning of the instruments after approved methods.

Though summer out-of-doors recreation is tempting, the need for vacation is apparently greater in winter than in summer. Scientific investigation has discovered that it is a great mistake to speed up at the end of January while in May nature lends her aid and human energy is increased. We are still more energetic in October.

Nervous America might well change her habit and relax in winter vacations when the need for slowing up is greatest.

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of absorbing matter, which extends from the sun for 600 trillion miles or more, is the idea advanced by Professor Edward S. King, of the Harvard College Observatory.

Professor King makes this suggestion after a study of the color of the stars, and points out that such clouds of absorbing matter are not unique. In many parts of the sky they hide the stars behind them, and they surround some star clusters. One of these is the famous group, the Pleiades, a number of stars loosely gathered together, and mixed in with such a "dust" cloud.

It has been suggested before that such a cloud extends through all space, and that its effect is to make stars look redder, as their light passes through a greater thickness of it. This effect is similar to the red sunsets which appear when the earth's atmosphere is full of dust.

If the clouds were present throughout the universe, the most distant stars would look intensely red, but this is not the case. Professor King does find that up to a certain distance, stars do get redder, the farther away they are; but beyond this distance, about a hundred light years, as the astronomer measures it, there is no increase in redness with distance. The light year is the distance that a beam of light will travel in one year, or about six trillion miles.

His observations may be explained, according to Professor King, if the sun and all the stars within that distance are in a dust cloud, so that the farther away they are, the more of the material their light has to penetrate, and the more of the blue rays they lose, making the light proportionally stronger in red. But the light from stars outside the local cloud has to penetrate the same amount of dust, regardless of how far the stars are.

THREE INDIAN CULTURES

CAMP sites thousands of years old on the plains of Texas and ancient funeral mounds in the wooded regions of the state may hold the secret of the relations of three of the greatest Indian civilizations of the American continent.

The Aztecs of ancient Mexico, the pueblo dwellers of southwest United States and the mysterious mound-builders of the Mississippi Valley form a triangle at the apex of which lie the remains of a little-known culture of prehistoric Texas, according to Dr. J. E. Pearce, professor of anthropology of the University of Texas.

Ancient camp sites, known as the "Burnt Rock Mounds," are found on the plains and prairies of Texas along streams and waterholes. These mounds are from four to five feet high and are made up of superheated limestone, with bones and other kitchen refuse. Nowhere else in the world are mounds of just this type found. Dr. Pearce found not only the bones of many animals and birds, such as the buffalo, deer and turkey, but also many human leg bones split for getting at the marrow. These Indians, with their at least occasional taste for human flesh, must have built one fire on top of another until, after thousands of feasts cooked on limestone slabs, the mounds piled up.

There is no doubt of their great antiquity because many of the mounds contain as much as 1,500 cubic yards of refuse, and one cubic yard of material piled up in a year is a fair estimate. The chances are that they are still much older than this accumulation rate would indicate, because the Indians were a nomadic race and the camp sites may only have been occupied for a few weeks all told in a year. The Texas Indians of historic times knew nothing of these mounds or where they came from and they were no longer used when the white man arrived. Dr. Pearce believes that their beginnings may go back from 2,000 to possibly 5,000 years.

Another group of prehistoric Texas Indians had established a civilization in the wooded parts of the state and built mounds in which to bury their dead. They were clever potters and rivaled the earthenware of the Mississippi Valley mound-builders. A study of the remains of these two civilizations may yield valuable data on the migrations and origins of early American cultures.

ITEMS

RADIO predictions of storms crossing the Atlantic Ocean steamship and airplane routes, broadcast from Greenland several days before they get where they can do any damage, is a possibility of the future, according to Professor W. H. Hobbs, of the University of Michigan. Professor Hobbs, speaking before the recent meeting of the American Philosophical Society, described the work of an expedition from the University of Michigan to Greenland to study the effect of weather conditions there on Atlantic storms. He believes that these storms originate over the great ice cap of this northern island. Last year preliminary studies were made, which will be continued this summer. A meteorological observatory, equipped with weather instruments as well as radio apparatus, will be established in southwestern Greenland, as near as possible to the ice cap, where two investigators will remain for a year. One of these is Professor J. E. Church, Jr., who has been in charge of the Mt. Rose Meteorological Observatory, two miles high in the Sierra Nevadas of California. He is an authority on snow surveys. The expedition this year will be in cooperation with scientists from Iceland, Germany and Roumania.

A DRUG that is designed to treat both syphilis and leprosy simultaneously is reported to have been successful in Calcutta. It was developed under the direction of Dr. T. A. Henry, at the Wellcome Chemical Research Laboratories in London, and consists of a mercury derivative rendered soluble in one of the complex compounds of chaulmoogra oil. Arsenical drugs are dangerous to administer to syphilitic lepers, so that some form of treatment for patients afflicted with both diseases that does not produce harmful reactions is highly desirable. Thirty lepers with syphilis were treated with the new compound by Dr. E. Muir, of the School of Tropical Medicine and Hygiene in Calcutta, with considerable success. After the course of treatment sixteen showed negative Wassermann tests, two were doubtful and only eight remained strongly positive, while the whole group showed improvement so far as the leprosy was concerned. The drug is said to be safe to administer and in none of the cases did it give rise to undesirable symptoms.

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SCIENCE NEWS

Science Service, Washington, D. C.

ADDRESS OF THE PRESIDENT OF THE AMERICAN MEDICAL ASSOCIATION

MEDICINE of the future will probably be less romantic, but more practical than the brilliant generation of achievement just past, was the opinion expressed by Dr. Jabez N. Jackson, of Kansas City, in his presidential address before the American Medical Association which opened on May 17 at Washington, D. C.

The future will hold less thrills than the present age of science, that has through its discoveries added fifteen years to the span of human life within the memory of men still living, Dr. Jackson said. The age of the pioneer is always exciting, for "facing uncharted fields with uncharted paths, each day is a new day and its future in 'the laps of the gods.' But let us remember that the builder is equal to the hewer, the organizer more important finally than the discoverer. The paths of progress have been blazed, but progress must be ever onward."

The really acute problem in modern medicine, according to Dr. Jackson, is hospital care for the class that makes up the great bulk of the population, the people with only moderate incomes. Modern hospitals with laboratories and trained assistance cost money. Unfortunately as the demands of science increase, the expense of everything connected with a hospital increases in proportion. Forty years ago the income of $300 from an endowment of $5,000 was enough to support one bed with hospital service constantly occupied for a year, less than a dollar a day. Now the cost of care of a patient in a city hospital ranges from $4 to $8 a day. This does not include the expense of special nursing, nor the doctor's bill.

The rich can afford this service and endowed charity hospitals are open to the very poor, but when the man in the street falls ill he recovers only to struggle with an avalanche of bills.

"What the public must learn is that for the protection of the middleman endowment is also a necessity—endowment that will at least provide for the expense of purely scientific service, modest compensation for the purely scientific laboratory expert who has no other source of remuneration and yet whose aid is a necessity to all who practice; endowment that will meet the expense which the generation of science has brought to medical service. Men of wealth have contributed most generously to the endowment of institutions for research, and we bow in acknowledgment of such wonderful contributions for the future good of mankind. The appeal of charity has likewise touched the heart and reached the pocket of men for contributions to absolute charity. And for such we give praise. But is there not possibly a higher service still: a service which unseen and unnamed is rendered to the man who is a man, though neither rich nor pauper—the fellow who builds a world, generous to rich and to pauper alike?"

MEDICINAL LIQUOR RESTRICTION

DR. WENDELL C. PHILLIPS, retiring president of the American Medical Association, in his address to the House of Delegates at the opening of the annual meetings of the association, called the attention of the medical profession to the recent decision of the Supreme Court supporting the action of the Congress to secure the enforcement of the Eighteenth Amendment that "arrogated to itself (Congress) the functions of the medical profession and the pharmacologist."

Medical men feel that there is active danger in legislation designed to regulate the practice of the art of healing which will place the mere opinion of untrained men and women on a par with the findings of impersonal research. Such a condition, he affirmed, whereby instances may arise when the fiat of the Congress may be in direct opposition to the trained judgment of a physician, holds a serious threat to public health.

Dr. Phillips exhorted fellow physicians to put up a united front on this important subject. The House of Delegates of the American Medical Association has expressed its disapproval in the past of those portions of the Volstead Act which interfere with the proper relation between the physician and his patient in prescribing alcohol medicinally.

"Individual opinions may vary; but individual opinions and convictions should not have a place or be given publicly, as representing the majority opinion of the members of the American medical profession" in connection with this matter.

Preventive medicine, not as a matter of sentiment but of sound business, was another measure urged by the medical leader. The public, which really pays the bills, he said, must be convinced that the medical profession is worthy of its trust as the initiators of a policy of disease prevention that will require, if it is to be effective, the expenditure of many millions of dollars.

"The medical profession should throw off its mask of reticence and its shrinking attitude toward reasonable publicity concerning health education. Professional policies narrowly conceived can never successfully oppose the rightful interest of the public. It is time to strike the shackles not only from the shrinking attitude of the medical profession toward the public espousal of educational programs, but also from its attitude toward the lay press, the radio and great assemblies of truth-seeking people. The physician has no right to conceal from non-medical readers the great body of news of the highest importance which is his to communicate."

PHYSICIANS OF THE UNITED STATES

REPORTS from all fields of medical activity were presented to the House of Delegates of the association prior to the opening of the scientific sessions later in the week. The United States has more doctors than any other country, with 133 physicians to every 100,000 persons, according to a statement made by Dr. Arthur Dean Bevan, of Chicago. Great Britain has 92 physicians per 100,000 people, while Germany has only 51. France lags behind with 35.

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The increasing demand of people everywhere for periodic physical examinations by their physician is a significant indicator of the trend of public opinion toward preventive medicine, according to Dr. Olin West, of Chicago, secretary of the association. Eleven state medical associations and 120 county associations have adopted a plan proposed by the association a year ago whereby cooperation with the Red Cross makes medical relief immediately available in times of disaster.

The efforts of the medical profession to abolish quacks and non-medically qualified healers has found expression in a basic science act drafted by the bureau of legal medicine and legislation. Two states, Wisconsin and Connecticut, have passed such laws requiring all those who apply for permission to practice healing the sick to demonstrate their knowledge of fundamental branches of medicine.

Medical education is undergoing a revolution in response to the changes brought about by modern methods of treating disease. The handicap of a long and expensive course necessary before a young man can begin to practice is being removed by revision of grammar- and high-school courses to save time. Adoption of the quarter system by which students may study during the time now spent in long vacations offers another avenue for short cuts.

LONGEVITY AND HEART DISEASE

More deaths from heart disease is one of the penalties people are paying for the increased span of life achieved in the past thirty years, according to a statement made by Dr. Henry Albert, health commissioner of Iowa. One hitherto unconsidered reason for the prevalence of heart disease, which outranks all other causes of death in the United States, is the survival of larger numbers of people from the attacks of infectious diseases.

Scarlet fever, rheumatic fever and venereal disease have all been brought more or less under control in recent years, but they leave behind them a constitution weakened in various ways. The injury sustained by a person who has had scarlet fever may not be apparent for twenty years, when it may reveal itself as a disease of the heart, liver or other organs. About 25 per cent. of all deaths from heart disease have their origin in rheumatism and more are being maimed by its effects than there were twenty years ago.

The prevalence of these two diseases is practically the same as it has been in the last two decades, but the death rate has been materially reduced. This leaves an increasing proportion of the population in a condition likely to develop heart disease when the "heart disease age" of forty-five plus is attained.

Ways and means of bringing down the toll of heart disease, which is responsible for one fifth of all the adult deaths in the United States, were discussed. Dr. Paul B. White, of Boston, stated that relaxation from strain and regular habits of living were of prime importance in the treatment of this disease. Rest was held to be essential for disturbances of the heart associated with goiter. Effective rehabilitation has been accomplished in many moderately severe cases of rheumatic heart disease, according to Dr. L. A. Conner, of New York. The development of special classes of vocational guidance, employment bureaus and convalescent homes were considered as possible means of helping people overcome the handicap of this malady.

Heart disease occurs much less frequently in children who have had their tonsils removed than in those who have not, according to a report by Dr. A. D. Kaiser, of Rochester, N. Y., who has made a study of 50,000 school children. The results of this investigation show that the child who has had his tonsils removed is also less likely to succumb to rheumatism and scarlet fever.

NERVOUS AND MENTAL DISEASES

Merely living in the complicated social system of today is responsible for increasing numbers of cases in the general hospital, says Dr. Groves B. Smith, neuropsychiatrist at the Henry Ford Hospital in Detroit.

In an address before the section on nervous and mental diseases of the association meeting he pointed out that much of psychoanalysis now practiced is an attempt to obtain from patients information the old-fashioned family physician knew about his patients merely from being a member of the community.

Emotional conflicts mask in many guises, and ill-advised medical or surgical treatment often results from failure to give such conditions sufficient consideration. The body and the mind have been looked upon as separate entities, but modern research in psychiatry is beginning to show that they are often very closely connected.

The popular idea entertained by lay persons and many physicians that control of nervous symptoms is a matter of will power is a misconception, according to Dr. Smith. He maintained that this was one of the most potent causes of increasing nervous tension. The solution of the problems of the neurotic person, he cautioned physicians, lay in unhurried examinations, humane understanding of social problems, tact and a frank recognition of the patient's inability to understand his own difficulties.

In the same section Dr. L. L. Cazenavette, of New Orleans, stated that mental disease in lepers is more frequent than is generally believed. He reported from a study of over 400 cases of leprosy in the National Leprosarium at Carville, La., covering a period of more than thirty years, that mental inferiority accounts for a large group of these disorders.

A working knowledge of the principles of mental treatment in all branches of medicine was strongly urged upon doctors by Dr. Cornelius C. Wholey, of Pittsburgh. There are several diseases encountered in general practice in which mental factors are of importance, he said, such as paresis, infection-exhaustion states, chronic anxiety and dementia praecox.

GERMS IN SWIMMING POOLS

Was the old swimming hole less of a hazard than the modern sterilized pool? Although strenuous efforts are made toward sterilization of water in swimming pools, infections have become so frequent in recent years that almost every family has been brought to grief in one way or another from swimming, according to Dr. Frederick E. Hasty, of Nashville, Tenn. The number of bac-

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teria in public pools is often under control, but little consideration has been given to the kind of bacteria present.

Guinea pigs inoculated with bacteria recovered from water from pools that had undergone various processes of sterilization developed practically every bacterial type of infection of the upper respiratory tract. The severity of the guinea pig infections was found to vary in proportion to the severity of the colds prevalent in the neighborhood at that particular time.

"Water gets into the nasal chambers of most swimmers, carrying with it the contamination of the pool and at the same time adding to the pool whatever bacteria may be present in the particular swimmer's nose.

"I have observed a number of boys who got sinus infection from one pool as a result of being required to duck ther heads," Dr. Hasty said. "Without an exception the infections cleared up in the course of a few weeks after leaving off swimming. Persons who have suffered from paranasal sinus infection or nasal obstruction are likely to develop acute attacks following swimming. The high percentage of frontal and ethmoidal sinus infection is due to virulent foreign bacteria reaching the vulnerable part of the nose and to a lowered local and systemic resistance."

ITEMS

THE black cloud of typhoid still hangs over the South. Country districts and towns with a population of less than 5,000 furnish 80 per cent. of the cases, Dr. D. G. Gill, of the state board of health of Alabama, reported to the American Medical Association. Unprotected water supplies are still the rule rather than the exception in the rural South and are responsible for many of the epidemics. Typhoid carriers, however, in Dr. Gill's estimation, are the source of most outbreaks through the direct spread of infection. Ten per cent. of the persons who have typhoid become carriers.

NEVER before has the world manifested so much interest in the welfare of its children. Clinics for crippled children established by the state, fraternal organizations and civic clubs have been an outstanding factor in the development of the branches of surgery designed to correct deformities, said Dr. J. P. Lord, of Omaha, speaking before the American Medical Association. State provision for handicapped children, clinics at state fairs, cooperation of county and district medical societies, and private benefactors have all enabled surgeons to acquire an enormous fund of experience.

IN spite of being one of the most progressive countries, the United States still leaves much to hope for with respect to its maternal death rate. Dr. S. Josephine Baker, of Stamford, Conn., pointed out in the section of obstetrics that this country has a higher death rate for mothers in childbirth than any other except Chile. The rate is one third higher than that of England and Wales, and more than twice as great as that of Denmark, Italy, Japan, the Netherlands, New Zealand and Sweden.

AGITATION is on foot to provide graduate training for general practitioners. Dr. George E. Shambaugh, of Chicago, stated that few universities are equipped to offer an efficient type of instruction to practitioners who are afraid that the tide of scientific advances in medicine is leaving them behind. He urged that other plans be brought forward to meet this demand.

TWELVE million dollars for state parks is the ambitious program projected for California by a number of civic organizations of this state. Bills now before the legislature provide for a bond issue of $6,000,000 to be matched by an equal amount from private gifts and other outside sources. A considerable part of the areas expected to be set aside under the new program will be in the famous California redwood country. These trees, closely related to the famous "big-trees," constitute a remnant of a once world-wide distribution of tree giants that flourished before the last great ice age. Individual trees now standing have been in existence since long before the beginning of the Christian era. For historic and scientific interest as well as for the sake of their scenic beauty a strong and fairly successful effort has been going on for some years, to save a part of the redwood forests from cutting.

IN a paper read before the National Academy of Sciences by Dr. Frank E. Denny, of the Boyce Thomson Institute, Yonkers, N. Y., it was explained that potato tubers when freshly harvested are dormant, and will not sprout if planted at once under growing conditions, the rest period lasting from 1 to 4 months in different varieties of potatoes. This period of inactivity may be shortened by treating the tubers with various chemicals. The gain in time of sprouting is about 2 to 6 weeks, depending on the variety of potato and the stage of dormancy at the time the treatment is applied. Twigs of apple, grape, lilac, also have this dormant period in autumn, and the buds of these species can also be forced into early growth, the gain in time of budding or blooming ranging from 1 to 9 weeks. The chemicals used by Dr. Denny include thiocyantes, thiourea and ethylene chlorhydrin.

Erratum: In the section of Science News in the issue for May 6, on page X, the last paragraph of the first column should read as follows:

"The fossilized implements are described by Dr. Osborn as of apparent human origin and of symmetrical shape. Among them are skin dressers for cleaning animal hides, pointed awl-like implements evidently used in sewing, neck ornaments made of strung bones and a kind of comb that seems to be a tattooing implement. Eighteen of the types of tools have been matched with counterparts found in the ruins of cliff dwellers of the arid regions of the Southwest and one type can be nearly duplicated by a much more recent implement from the shell heaps of eastern America. But unlike the implements of Europe which are usually weapons and hunting tools, the Nebraska artifacts are nearly wholly related to the peaceful arts. Further investigations are to be carried on this summer."

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SCIENCE NEWS

Science Service, Washington, D. C.

THE BACILLUS OF TRACHOMA

ONCE more modern science scores against disease. The isolation of a small bacillus, believed to be responsible for trachoma, the disease that has blinded thousands of Indians, has been announced by Dr. Hideyo Noguchi, of the Rockefeller Institute for Medical Research, New York.

Five Indians with trachoma from the Albuquerque Indian School, whose eyes had been operated on, furnished the cultures with which Dr. Noguchi was able to produce the disease in monkeys. From these he recovered the germ and inoculated other chimpanzees that in turn developed the characteristic inflammation of the eye. This is considered rather conclusive proof that the guilty organism has been found. A preventive vaccine and curative serum have not developed, but this is the next logical step in the investigation of the disease.

Dr. Noguchi became interested in the trachoma problem through Dr. F. I. Proctor, of Boston, and began this research with the cooperation of Dr. Polk Richards, of the U. S. Office of Indian Affairs, less than a year ago.

Trachoma is a disease of unhygienic living, widely prevalent in Egypt, Asia and among the Indians of this country. It is one of the few diseases that absolutely prohibit an immigrant from entering the United States. Of 38,111 Indians in the Southwest examined for trachoma in the fiscal year ending June 30, 1925, 7,236 were found to be suffering from it and among these it was found necessary to operate on 4,285. About 19 per cent. of the Indians of the Southwest, it has been estimated, are afflicted with the disease.

This first step in the conquest of trachoma was hailed as a major medical achievement by doctors and scientists at the recent meeting of the American Medical Association. Dr. Noguchi has isolated and cultivated the causative organism of yellow fever and made important contributions to the subduing of syphilis, smallpox, rabies and oroya fever.

FLOOD HEALTH MEASURES

PESTILENCE, riding the crest of the Mississippi Valley flood, is being battled by health and sanitation forces on a scale unparalleled in the peace-time history of this country. Reminiscent of measures instituted during the world war in army camps and refugee centers is the gigantic program being advanced by the American Red Cross and cooperating agencies.

Dispatches daily to national headquarters of the Red Cross at Washington state that 95 per cent. of the total population of the flood area have had at least one injection of typhoid serum and that half a million will be immunized against smallpox and typhoid before the close of emergency relief work.

Dr. William R. Redden, Red Cross medical director, states that 8,000 are being vaccinated daily against smallpox and 10,000 against typhoid. Thousands have been given quinine doses as a precaution against malaria and between 6 and 7 tons of quinine will be administered for this purpose as mosquitoes begin to breed in the stagnant back-water.

Ninety-two nurses, fifty-eight doctors and thirty sanitary engineers are on duty in the seven states affected, according to Dr. Redden, and as a result outbreaks of disease are being checked satisfactorily, with actually less disease, in Dr. Redden's opinion, than under normal conditions.

Following a recent meeting in Memphis, the relief base, attended by health and sanitation experts of the Red Cross, American Medical Association, U. S. Public Health Service and other agencies, plans were announced to take care of sanitary conditions made acute by the recession of the flood in Arkansas and Mississippi.

Dr. Redden wired headquarters that an exhaustive survey of the terrain was made during the week, which showed that Arkansas has 15,000 head of dead livestock and Mississippi 25,000. To neutralize this menace, 50,000 pounds of chlorinated lime will be used in the two states and one carload of dehydrated lime per county in addition. One carload of crude oil per county will be spread over stagnant waters to prevent the maturing of mosquito larvae.

Emergency county health units are being established in the two states, through which the Red Cross will carry on a concentrated battle against disease, lasting from 30 to 60 days.

Maneuvers of the health forces are often spectacular, involving the use of airplane and radio. A call for typhoid and smallpox serum from Winnsboro, La., brought into action a Coast Guard airplane which set out from Natchez. It was necessary for the pilot to transfer to a train at Clayton, getting as far as Sicily Island, where the flood blocked rail travel. The guardsman procured a second-hand car in which he proceeded within two miles of his objective. Forced to abandon this he advanced on foot through water always knee-deep, sometimes deeper, arriving after nightfall with the supplies.

"Serious epidemic dysentery; must have medicine immediately." Across 60 miles of ether this message was flashed to Red Cross headquarters at Memphis. Within half an hour a Navy seaplane, loaded with the medicine, headed for Bruin, Arkansas. An hour later doctors in the camp were administering it. Without a plane it would have taken several days of tedious travel and it is probable that many lives would have been lost.

OBSERVATIONS OF THE LUNAR ECLIPSE IN CANADA

THE Royal Canadian Mounted Police will join with representatives of the Hudson's Bay Company in Canada, Catholic missionaries to the Eskimos, fur trappers and representatives of the U. S. Weather Bureau and Signal Corps in Alaska, to make scientific observations of the total eclipse of the moon on June 15. This announcement

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has been made to Science Service by Dr. Willard J. Fisher, of the Harvard College Observatory. These groups will make particular note of the weather conditions in Canada in the early morning hours of June 15.

Lunar eclipses occur when the moon gets within the shadow cast by the earth. As the moon is illuminated only by the sun, it appears darker under such conditions than at time of full moon. It would disappear entirely were it not for the earth's atmosphere.

On a clear evening, as the sun sets, we see the sun for a little while after it has actually gone below the horizon, because the atmosphere bends the light rays around the horizon. A similar effect is observed when a stick, partly immersed in water, looks bent. In the same manner, the earth's atmosphere bends some of the light around it and into its shadow, giving the eclipsed moon some illumination. A sunset appears red because the thick layer of air absorbs the blue rays and permits only the reddish rays to pass. The light that gets through to the earth's shadow to illuminate the eclipsed moon has to pass through twice as much air as does the light from an ordinary sunset, with the result that the eclipsed moon shines with a copper-red glow.

As clouds in the part of the earth's atmosphere through which the light passes absorb a certain amount of it, Dr. Fisher has called in the assistance of the Canadian Mounted Police, the missionaries, and the other groups to observe weather conditions along a line from Great Slave Lake, in the Canadian Northwest Territories, across Baker Lake, which drains into Chesterfield Inlet, on the west coast of Hudson Bay, and down to Nova Scotia. It is along this line that the light which is bent into the earth's shadow will just graze the earth. Observations of the state of the atmosphere, whether clear or cloudy, at 3: 24 A. M., eastern standard time, when the moon is most completely immersed within the earth's shadow, may be checked with observations made elsewhere of the eclipse itself, for as the moon will just be setting at the time, and the sun rising in the east, the eclipsed moon will hardly be visible to the Canadian observers.

GIPSY MOTH CONTROL

GIPSY moth control to save New England trees has met with a new complication. One of the most important parasites of the gipsy moth which the U. S. Bureau of Entomology imported from Europe is being hampered in its good work by the presence in this country of insects which have recently attacked it. The damage being done is extensive. In the majority of cases, 65 or 70 per cent. of the beneficial parasites are being destroyed. About 35 species of insects are attacking the beneficial one, but the real damage is being done by only a few, including in their number three species of chalcid flies new to science, according to the U. S. Bureau of Entomology.

"The situation is illustrative of the difficulty of natural control," said Dr. L. O. Howard, chief of the bureau. "To establish imported parasites of pests of foreign origin is not the simple thing that people think. Nearly all primary parasites are subject to attack from parasites of their own. In bringing in beneficial parasites the entomologists are careful not to import with them their natural enemies. But it happens that they often belong to groups which are represented in the United States by parasites of native insects. These have their own parasites which are quick to attack the European importations related to their native host. This intricacy of relationship between species of insects greatly complicates the business of importing the parasites of pests accidentally brought into this country."

PUBLIC HEALTH AND THE SURVIVAL OF THE FIT

"SURVIVAL of the unfit," a stock objection by hard-boiled critics of public health work, was declared to be a bogey conjured up by the perfervid imaginations of persons to whom a little learning has proved a dangerous thing, by Professor H. S. Jennings, of the Johns Hopkins University, one of the world's foremost students of evolution, genetics and eugenics, who spoke at the meeting of the National Tuberculosis Association in Indianapolis.

Fitness, Professor Jennings pointed out, is only a relative term, and an individual at whom the finger of scorn is pointed, as being "unfit" so far as resistance to tuberculosis or some other ailment is concerned, may be very "fit" indeed when it comes to doing useful work in the arts, sciences or business. Wipe out the disease, as yellow fever has been wiped out, diphtheria is being wiped out, and as tuberculosis can be, and the "unfitnesses" of the persons now susceptible to them automatically disappear, for there is nothing left for them to be "unfitted" to. Therefore to argue that nothing should be done to control diseases that take large toll of human life is not merely harsh and inhuman, but silly, in the opinion of Professor Jennings. "For most of the matters with which the public health worker deals there appears to be no indication whatever that the individuals preserved are undesirable, or at a disadvantage in a world in which the attacking agent has been controlled, no indication that defective genes are playing an important rôle."

LEARNING BY ADULTS

A MAN or woman under 50 years of age should seldom be discouraged from trying to learn anything which he or she really needs to learn by the fear of being too old, Dr. E. L. Thorndike, professor of educational psychology at Columbia University, said at the meeting of the American Association for Adult Education in Cleveland. To a lesser degree, this is true after 50 years also, he added.

Dr. Thorndike presented results of experiments in which persons 35 years and over, averaging 42 years, were compared with persons 20 to 24 years old, averaging 22, in their ability to learn acts of skill and to acquire various kinds of knowledge.

In learning Esperanto, an artificial language constructed on logical principles, the older group learned about five sixths as fast as the younger. Both groups learned more rapidly than children.

In learning reading, spelling, arithmetic and other elementary school subjects, adults of 42 progressed about five sixths as fast as the adults of 22. Both groups probably learned faster than they would have learned the same things as children at the age of 12, for they learned more

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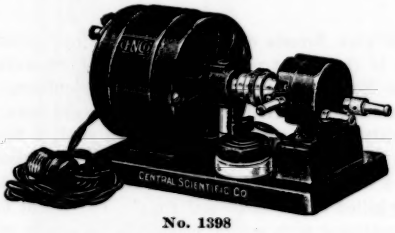

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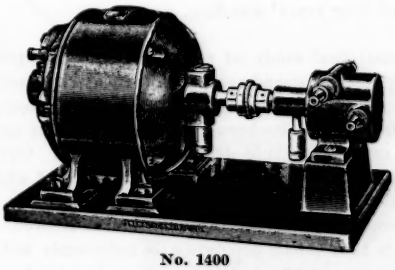

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per hour of study than children comparable to them in brightness are able to learn.

Extensive experiments with adults learning algebra, science, foreign languages and the like in evening classes, and with adults learning shorthand and typewriting in secretarial schools, support the general conclusion that ability to learn rises until about 20. Then, perhaps after a stationary period of some years, learning ability slowly declines. The decline is very slow, however, roughly about one per cent. per year. The chief reason why adults seldom learn a new language or a new trade is not the lack of ability, but the lack of opportunity or desire.

ITEMS

KILLING off one disease through the action of another is a medical method of increasing interest. Treatment of the paralytic forms of syphilis with inoculations of malaria has had a three years' tryout at the Mayo Clinic and was pronounced the most valuable method used thus far, by Dr. Paul A. O'Leary, of Rochester, Minn., at the meeting of the American Medical Association. Many more years of observation will be necessary, however, Dr. O'Leary emphasized, before it will be justifiable to speak of the "cure of paresis." Results must now be estimated in terms of arrest or remission, he said, as shown by the ability of patients to resume their former mode of living. The malaria treatment is not without risk as the mortality of five per cent. recorded by Dr. O'Leary shows, but he believes that this rate compares favorably with that of any untreated group, observed for the same length of time. The greatest improvement was noted where the malaria was introduced early in the course of the paresis, but striking results were cited by the Rochester specialist in cases of four years' standing.

IN a statistical study of conditions since the passage of the eighteenth amendment, presented at the American Medical Association recently, Dr. Leonard G. Rowntree, of the Mayo Clinic, Rochester, Minn., stated that alcoholism has made a striking decrease since 1917. Cirrhosis of the liver, a degenerative disease, one form of which is due to alcoholism, is also decreasing in about the same proportion, the Minnesota doctor's figures showed. The contention that urban population is notoriously wet, and rural sections notably dry, is borne out by the fact that both these conditions are found to occur most frequently in cities and are about half as prevalent in the country as in the city. Deaths from too much booze in New York in 1920 were only one seventh of those in 1916 and deaths from cirrhosis fell off more than half. In the dry and rural state of Kansas the death rate for both conditions has remained about the same as before the war. It is interesting to note, said Dr. Rowntree, that the highest mortality rate for alcoholism and cirrhosis recorded in Kansas in the last fourteen years represents the low-water mark for deaths from the same cause during the same period in New York.

DR. JAMES W. GIDLEY, paleontologist of the U. S. National Museum, has returned from a partially successful search for elephant bones to complete a great mammoth skeleton being assembled for exhibition purposes. Near Alva, Oklahoma, he found portions of a small elephant which were of considerable scientific interest but of a different species from the composite skeleton which the museum experts are mounting. This particular variety of mammoth came from Florida and attained a huge size, twice as large as the ordinary elephant of to-day. A prehistoric relative of the armadillo, probably a hitherto unknown species about as large as a cow, was among the skeletons. The thorough exploration of Oklahoma for animals of past ages is urged by Dr. Gidley. He states the state is rich in rock formations containing evidences of the life of 500,000 years ago.

THE pine forests of the future will not perish in infancy if the recent research efforts of J. Stewart Wiant, of the New York State College of Agriculture, are put to practical use. Hitherto there has always been a heavy mortality in pine plants started from seed in forest nurseries and later set in the hope that they may become huge trees a century or so later. The tender young plants are easily killed by parasitic soil fungi. Dr. Wiant finds that soil treatment with several chemicals, especially with some recently discovered chlorophenol mercury compounds, destroys these parasites and permits the baby pines to develop until they are strong enough to be secure against these enemies.

LACE-MAKING has become a Chinese home industry of considerable importance, according to figures published in a survey of industrial and commercial conditions in China just issued by the U. S. Department of Commerce. The customs returns show lace exports amounting to over $4,000,000, and this probably does not cover the entire quantity. The Irish lace industry was introduced into Swatow as recently as 1920 and it is said that the laces produced are equal, if not superior, to those originally made in Ireland. In several cities around Shanghai, many Chinese women and girls are busy in making filet lace. The low cost of Chinese labor makes the retail price, even with the high tariff, much cheaper than the handmade laces of Europe.

THAT tin, the metal with which most metallic food containers are lined, has absolutely no effect on the human body is the finding of Drs. E. W. Schwartze and W. F. Clarke, of the U. S. Department of Agriculture. Selecting asparagus and pumpkins as two kinds of preserved food which might be expected to enter into chemical union with the tin lining of the cans in which they had been preserved for long periods, they have been unable to demonstrate the slightest unfavorable effects of the vegetables when they were fed to guinea pigs. Further, they administered tin metal in two-gram lots, more than all the tin on several large cans, to human beings over a period of five days. By the most refined analytical methods they could find no trace of tin in the blood stream, indicating that none had been absorbed by the body. It is also proposed to determine the effect on steel cans lined with enamel instead of with a tin coating.

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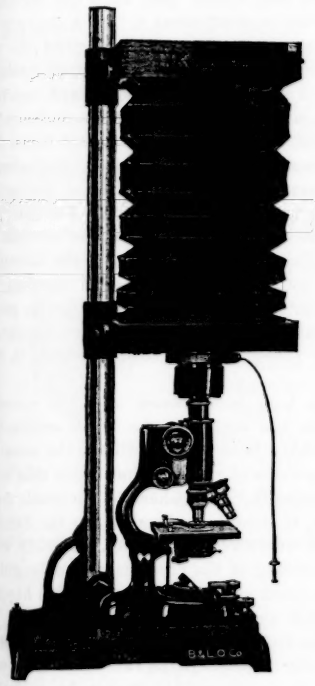

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SCIENCE NEWS

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THE ISOLATION OF HEPARIN FROM THE LIVER

FROM the liver of dogs, Professor W. H. Howell, of the Johns Hopkins University, has prepared an anti-coagulent that will keep a sample of blood in a practically normal condition for twenty-four hours.

Clotting is nature's protection against bleeding to death, but this tendency of the vital fluid to congeal after its exposure to the air offers serious disadvantages in blood transfusions and certain types of important experimental work. This new clot-preventing substance, which has been named heparin, is of great interest, therefore, to surgeons, pathologists and other specialists who deal with blood, particularly those who make the various blood tests used in detecting disease.

Heparin was obtained and used by Professor Howell in a crude form several years ago, but recent research has yielded this purified and potent form, the action of which is very much more powerful. One milligram in 100 cubic centimeters of blood will prevent the sample from clotting. Injected into the blood of persons in the same proportions, heparin will entirely prevent coagulation for about an hour. This property is gradually eliminated in about three hours' time, when blood from such patients will clot as usual.

Dr. Alexis Carrel, of the Rockefeller Institute for Medical Research, has been using the purified form with good results in his cell cultures, while Dr. L. G. Rowntree, of the Mayo Clinic of Rochester, Minn., has used the old crude form with success in blood transfusions for several cases of anemia, according to Professor Howell.

It is expected that heparin will be of most use in the cases where large amounts of blood, over one pint, are needed. In ten transfusions cases of secondary anemia requiring this amount, where heparin was used under Professor Howell's direction, eight were entirely successful and only two had slight chills after the transfusion was completed.

The chemical analysis of heparin is not entirely complete, but it appears to be a carbohydrate. It seems to be perfectly stable, said Professor Howell, for specimens kept all summer in the Johns Hopkins laboratory remained unchanged and show no signs of deterioration either chemically or from the action of bacteria or mold. It has the additional advantage of being able to withstand sterilization and boiling without harm.

THE SINKING OF LAND AS A CAUSE FOR THE MISSISSIPPI FLOODS

THE slow sinking of the lower Mississippi Valley, closer and closer to sea level, is suggested as one of the possible causes of disastrous floods like the one now raging, in a geological essay prepared by Dr. David E. White, of the National Research Council, for the meeting in Washington, D. C., of the American Shore and Beach Preservation Association. The Gulf coast is not known to be sinking, but that may be simply because adequate studies have not yet been made of it, Dr. White stated. He pointed out the well-known fact that the Atlantic coast is sinking at the rate of about a foot a century as of importance in this connection. "Geologists do not know whether a portion of the lower Mississippi basin is now being depressed as the result of downward bending of the crust of the earth in this region of the continent," Dr. White continued, "but they do know that there has been downward movement of very late date, geologically speaking, in this part of the Gulf coast. Some geologists believe the movement to be still in progress. Further, the well-known occurrence of earthquakes in the stretch of the valley between Cairo, or New Madrid, and the Memphis region shows that movement, with probable warping or dislocation of the outer part of the crust, is going on in that part of the valley. The earthquakes are unmistakable signs of such changes, mostly out of sight, in the buried strata.

"Finally, it has long been known and has recently been confirmed that the region to the north embracing the Upper Great Lakes is now being tilted, the area on the north being in process of rising higher above tide level than the area to the south. Somewhere to the south there should hinge a line, if there is no bending, to the farther southward of which depression or sinking, probably with some warping or twisting of the crust, may now be going on with perhaps as much certainty as earthquakes happen between New Madrid and Memphis.

"If a part of the Gulf coast embracing the lower Mississippi reaches is now subsiding, the rate of sinking will be so slow as to be imperceptible except by scientific methods, and the effects may appear negligible at first thought; yet such a movement, however slow, would be of ultimate far-reaching significance, for it must gradually in the course of time cause slackening of the currents; it must slowly render it more difficult for the river to keep its lower trench clear from filling by sediments, and it must carry regions subject to flood lower down and nearer sea level, except as, on the other hand, these regions may be built up at the same time by flood contributions of sediments derived primarily from the higher lands or by organic debris, accumulating especially in the swampy areas.

"It is important that the question of the slow subsidence of any part of the lower portion of the Mississippi trench system be definitely determined by scientific and engineering observation and research. If downward movement is now in progress we must know the rate of subsidence, and if this rate is sufficiently great engineering plans, if they are to be permanently successful, should take cognizance of the fact and be adapted to counteract its effects. This is a research problem of national scope as well as importance, and should be thoroughly organized, carefully manned, and carried to con-

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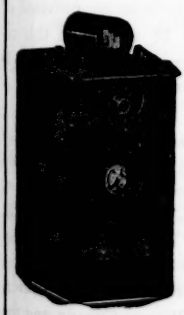

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clusions, possibly under government auspices, with such collateral aid from state agencies of a kind fitting into a well-planned research program as may be forthcoming from the states concerned.''

Of more local and immediate importance, Dr. White suggested, is the question of the silting up of the river channels. The levee system is based partly on the assumption that the streams confined therein will scour their own channels clean; but to date noboby has taken the trouble to find out whether this actually happens. If the rivers really drop their loads of silt and sand on their bottoms instead of carrying them out to sea and dumping them there, according to current engineering assumptions, eventually the bottoms of the rivers will be higher than their banks, and the game of levee-versus-river can go on upward indefinitely but always with increasing peril to the lowlands. A geological study of river-bottom deposits, Dr. White stated, can be made in a few years at relatively small expense, and he recommended that steps in that direction be taken immediately.

THE SPECTROHELIOGRAPH AND THE AMATEUR ASTRONOMER

To the radio amateur, there may soon be added the amateur solar observer, and just as the amateur radio experimenter has been responsible for many of the great advances in wireless communication, the amateur solar observer may do a great deal in the future to aid astronomers in solving the mysteries of the sun, nearest of all stars, and the one upon which our very life depends.

Already there are numerous amateur astronomers, but they are largely concerned with the study of stars which change their light more or less periodically. However, by means of the spectrohelioscope, an instrument that can be made at a cost not exceeding that of a good radio set or a cheap automobile, activities on the sun which a few years ago were invisible to astronomers may now be watched.

The spectrohelioscope has recently been developed by Dr. George Ellery Hale, honorary director of the famous Mt. Wilson Observatory at Pasadena, Calif. In the last few years he has been observing the sun regularly with it from his private observatory. In an article in the English scientific magazine, *Nature*, he tells of his latest observations, and how he has been able to see large clouds of hydrogen vapor on the sun rushing into the sun spots.

Many years ago, Dr. Hale invented a somewhat similar instrument by which it is possible to photograph the sun in the light of a single wave-length, or color. As each element, when its light is analyzed by the prisms of a spectroscope, shows characteristic colors, which belong to no other element, the device makes it possible to take pictures of the sun by the light of only one element, hydrogen, for example.

However, observations with the spectroheliograph, as the earlier device was called, were not always clear, Dr. Hale states. It was not possible to tell which way the clouds of hydrogen were flowing, whether into the spots, or out of them, but the direction could only be inferred. Though a series of pictures could be taken in rapid succession, he says, the critical moments at which the hydrogen was drawn into the spot were rare, and only good luck would permit a photograph to be made at the proper moment. Among the thousands of spectroheliograms of the sun made at the Mt. Wilson Observatory, only once, and that in 1908, has such a phenomenon been recorded.

The spectrohelioscope, however, permits the observer to watch the sun, in the light of a single wave-length, and so the ebb and flow of a single element can be watched. And then, if necessary, a photograph could be made at the proper moment. With the instrument, says Dr. Hale, he has repeatedly seen great clouds of hydrogen suddenly develop near an active sun spot, and then rise up and descend into the spot, with a speed of as much as 1,600 miles a minute.

THE EARTHQUAKE OF MAY 22

MONTHS may elapse before details of the earthquake which was felt by seismograph instruments throughout the world on Sunday, May 22, are known, even though it was one of the most severe quakes on record and thousands were undoubtedly killed. According to Commander N. H. Heck, in charge of the earthquake investigations of the U. S. Coast and Geodetic Survey, after studying reports from seismograph observatories gathered by Science Service, the quake was about 35 degrees north latitude, and 100 degrees east longitude, which places it in western China, or eastern Tibet. It occurred at 5:33 P. M., eastern standard time.

This region is one that has been visited by destructive quakes in the past, for on September 16, 1920, there occurred the Kan-Su earthquake in the same region, named after the province of China in which it occurred. At this time, though the damage was severe, and an estimated total of 100,000 persons were killed, it was three months before the outside world knew about it.

According to Commander Heck, the quake on May 22 appears to have been at least as severe as the one in 1920. In some respects this country resembles California, for the fault lines, along which the quakes occur when the two parts of the ground slip over each other, tend to run east and west. The damage that was done by the quake may have been in Tibet, as well as in the Kan-Su province of China. Much of the damage done by quakes in this region is due to landslides, caused when the loose soil is shaken. These may also bury whole villages which may never be heard from again.

The reports upon which Commander Heck's determination was based were gathered from the seismographic observatories of the U. S. Coast and Geodetic Survey at Cheltenham, Md., and Honolulu, T. H.; that of the U. S. Weather Bureau at Chicago; the University of California at Berkeley; Georgetown University, Washington; St. Louis University, St. Louis; Regis College, Denver, Colo.; the Dominion Observatory, Ottawa, Canada, and the Meteorological Observatory at Victoria, B. C.

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TRANSMISSION OF PLANT DISEASES BY A LEAFHOPPER

JUST as yellow fever is due to an invisibly small germ or virus carried from person to person by an insect, so are some of the most serious and destructive illnesses of plants due to invisibly small germs carried from plant to plant by an insect.

In a report to the Engineering Foundation, Dr. L. O. Kunkel, plant pathologist at the Boyce Thompson Institute for Plant Research, Yonkers, tells how a little gray insect, the aster leafhopper, spreads the yellows disease of asters by first biting sick plants and then, after the virus has had ten days to incubate in its interior, biting healthy ones and planting the infection in their tissues.

The same leafhopper that transmits yellows to the China aster also carries it to more than fifty other species of wild and cultivated plants. Lettuce is one of the most important hosts of aster yellows. On this plant it has long been known in the Southwest as the Rio Grande disease and in New York and other eastern states as the white heart disease. In the winter, yellows lives on perennial weed hosts. During the summer, when the carrier-leafhopper is very active, it spreads rapidly to susceptible annual plants such as the China aster and lettuce.

Spread of aster yellows and its host range depend largely on the likes and dislikes of the aster leafhopper. The African marigold is quite susceptible but seldom takes the disease even when grown adjacent to yellowed aster plants. The leafhopper does not like the marigold and seldom feeds upon it when other plants are available. If confined in a cage containing only marigold plants, hunger drives it to feed upon them and they readily take the disease. It is fortunate that although wheat and other cereal crops are favorite hosts of this leafhopper, they are immune to the yellows.

The aster leafhopper is thought to have been accidentally introduced into the United States from Europe fifty or more years ago. Although it is prevalent in Europe and the Orient, where the China aster is extensively grown, the aster yellows disease is known only in America. Thus, a disease which is apparently endemic in America has been rendered much more serious through the importation of a European leafhopper, and of an Oriental plant, the China aster.

No satisfactory means is known of controlling the aster leafhopper, but the yellows which it spreads can be held in check by digging out all infected perennial weed hosts in the vicinity of the field to be protected and by destroying all diseased annuals as soon as observed. A yellowed plant is a menace to nearby healthy plants just as a malaria patient is a menace to a healthy community in a region infested with the Anopheles mosquito.

THE PREDICTION OF TRACK RECORDS

STAR athletes looking for a chance to break a world's record on the running track should tackle the 880-yard run.

This suggestion comes not from a coach or trainer, but from recent calculations made by Dr. Earle R. Hedrick, of the University of California, editor of the *Bulletin* of the American Mathematical Society. According to Dr. Hedrick's diagram of the situation, the record of 1 minute, 52 seconds, made in the 880-yard race represents the least worthy performance among the recognized world's record races from the hundred-yard dash to the two-mile run. It is reasonable on this basis to expect somebody to cut five seconds from the present record without setting a new standard of human strength and endurance. On the other hand, it is considered unlikely that anyone will lower the record of 47.4 seconds for the 440-yard curved-track race.

Adopting the rule that fatigue bears a direct mathematical relation to distance traveled, Dr. Hedrick was able to draw a smooth logarithmic curve which tells at a glance what a record performance should be in a race of any distance above 100 yards. The shorter races are not considered because of the relatively great errors due to the time of getting started. In his diagram the mathematician finds that the 220-yard, the 440-yard, two-mile and even the 100-yard record all fall nicely on an orthodox line, and are thus tentatively assumed to indicate a maximum human performance. At least no record in any other race is better. The 880-yard and mile records, however, run as much as five seconds too high. Inasmuch as the 880-yard distance is the shorter of the two, the deviation here has the most significance of any recorded. Unless there is some physical factor, still unknown, which should enter the mathematical equation, the 880-yard mark looks to be the easiest of conquest.

An important use of this athletic diagram comes in the attempt to evaluate European records based on races run with metric measurement. A 1,000- or 1,500-meter race, which calls for a degree of fatigue not corresponding exactly to any American race, is thus readily checked and appraised. The suggestion has been made that an athletic prize should be awarded to a runner not for breaking some odd record that happens to be extant, but rather for convincing the sporting mathematician that he can break over the logarithmic fatigue line that is supposed to be the border of human endurance. Under these conditions nobody would know who won a track meet until a report was handed down by the professor of analytic geometry. But the rah-rah boy, hoarsely yelling at a sprinter staggering across the finish line, probably isn't thinking in terms of logarithms!

ITEMS

STEAM in occasional hissing jets, the last breath of the once raging volcanic vent, still melts the snow among the glaciers at the top of Mt. Rainier, according to Dr. F. E. Matthes, of the U. S. Geological Survey. For this great cone-shaped mountain, which now supports one of the most magnificent single-peak glacier systems in the world, was in long past ages a volcano. As the season advances, the great rivers of ice are beginning to flow more rapidly, until during the warmest weather they will move at a rate of from 12 to 18 inches a day. This does not mean, however, that they extend their range farther down the slopes, for they melt off as fast as they flow forward, and sometimes faster. Some of the glaciers have undergone notable losses during the past thirty or forty years.

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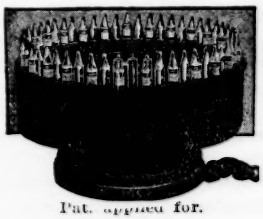

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SCIENCE NEWS

Science Service, Washington, D. C.

ANIMAL LIFE IN HOT SPRINGS

THOUGH always in hot water, many forms of animal life that inhabit the geysers and thermal springs of Yellowstone National Park and similar regions the world over appear to thrive and enjoy life, according to an article by Professor Charles T. Brues, of the Bussey Institution, which will appear in the forthcoming number of the *Quarterly Review of Biology*.

Professor Brues has conducted investigations in Yellowstone Park, and assembled data from studies in other parts of the world, all of which indicate that practically all of the principal fresh-water forms of life, and many that inhabit brackish or briny waters as well, are represented in the populations of these steaming baths. None of the animals favors the hottest waters, which reach temperatures between 190 and 200 degrees Fahrenheit, though plants of lowly classification can live in these places. The animals live in the cooler parts of the springs, though even in these the water is continually as hot as the hottest summer day at noon. Thus, he found water-beetles in water of 90 to 100 degrees, the larvae of a species of horsefly at 91 degrees, a water-bug at 96 degrees, snails at the same temperature, and bloodworms at 120 to 124 degrees. He found a small animal related to the crayfish in slightly cooler but still tepid water, and identified it as the same species that lives in the Arctic in ice-cold ponds.

Temperature, Professor Brues states, is not the only problem these animals have to solve. When the water is warm it holds but little oxygen in solution, and they have to breathe somehow. Some of them, like the mosquito "wrigglers," do so by coming to the surface for air, while others seem to have adapted themselves to the small supplies of this necessary element afforded by the water. Moreover, the water frequently contains an excess of carbon dioxide in solution, and sometimes poisonous chemicals, such as sulphuretted hydrogen gas and arsenic, and they have to be able towithstand these. Finally, the water always has either limestone or silica in solution, and the former is especially ready to precipitate if the temperature drops a little, threatening constantly to enclose in a mummy-case of chalky material any small animal luckless enough to be caught away from water hot enough to keep the stony material properly dissolved.

RESULTS OF INBREEDING ON NORFOLK ISLAND

PROVIDING the original stock is sound, inbreeding among human beings results in no deterioration, physical or mental. Nor does mixture of widely differing races produce an inferior type. Such are the conclusions of Dr. Harry L. Shapiro, ethnologist of the American Museum of Natural History, from recent study of the inhabitants of Norfolk Island, a small island north of New Zealand. They are Tahitian-English half-castes whose history dates back to the mutiny of the crew of the ship *Bounty* in 1789. At present there are more than 600 of these islanders and they are the descendants of twelve Tahitian women and nine Englishmen, part of the mutinous crew.

In 1789 the crew of the *Bounty*, a vessel sailing in the southern Pacific, mutinied, casting the captain adrift in a small boat and making for Tahiti. Here nine of the crew, fearing capture, sailed to Pitcairn, a small uninhabited island east of Tahiti. They took with them twelve Tahitian women and nine Tahitian men. On Pitcairn the women were divided among the Englishmen as wives. The Tahitian men were allowed no women. This led to jealousy and the Tahitian men were killed, leaving no descendants. The Tahitian women and the Englishmen all of them sound stock established a line of half-castes. They were completely isolated and they multiplied rapidly.

By 1856 the population was too great for the small space of Pitcairn. More than 150 moved to Norfolk Island which was at that time uninhabited. To-day there is a population of 600 on Norfolk Island and 175 on Pitcairn, all the descendants of the original Tahitians and English. It is of the Norfolk Islanders that Dr. Shapiro has made a study.

Dr. Shapiro has found these islanders to be of sound physique, taller than the average English and Tahitians, and of good mentality. There is only one feeble-minded person, he said, on Norfolk Island. Their education has of necessity been rudimentary for generations, but they are now provided with teachers by the Australian Government under the jurisdiction of which they come. And the teachers are getting excellent results.

Thus, according to Dr. Shapiro, the Norfolk Islanders prove that, when the stock is sound to begin with, intensive in-breeding makes for no decrease in stamina. Likewise, race mixture, in his opinion, brings no deterioration.

The idea that the half-caste is inferior, he maintained, comes largely from the fact that pure races have always looked down on the half-caste. In Norfolk Island, he said, the half-caste has a chance to show his worth, for there is no discrimination against him, as the entire population is half-caste. And Norfolk Island, he pointed out, is one of the only places in the world in which no stigma is attached to half-castes.

THE COMING ECLIPSE OF THE MOON

AMATEUR astronomers will have the opportunity of aiding their professional brethren in observing the eclipse of the moon on the early morning of June 15. The eclipse will be visible throughout the country, clear weather permitting, and Dr. Willard J. Fisher, of the Harvard College Observatory, has made a special appeal for amateur observations. Persons living in the southwestern part of the United States will probably have the best chances.

"Clouds are possible at even the biggest observatories," he said, "and the results of a few amateurs may be valuable on that account, if for no other reason."

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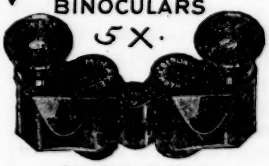

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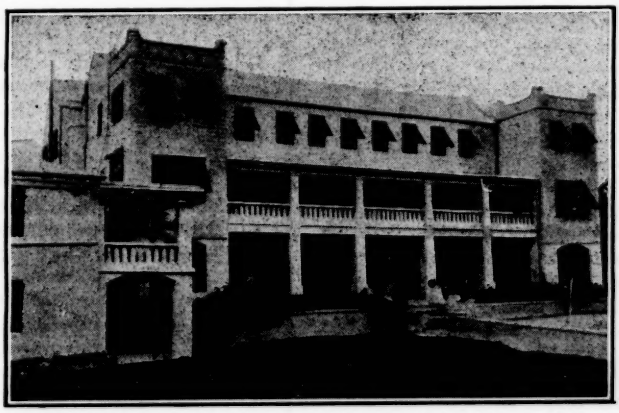

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A unique feature of the eclipse is that it is just barely total. At 12:34 A. M., eastern standard time, on the morning of June 15, the moon will enter the outer part of the earth's shadow, or the penumbra. The shadow of the earth extends out into space on the side opposite to the sun, and is in two parts. Outside is the penumbra, in which a person floating out in space would see the sun partly covered by the dark disc of the earth. But if this imaginary observer were located within the umbra, or inner shadow, the sun would be entirely obscured by the earth. The only light reaching him would be that bent around the earth, and into the shadow, by the earth's atmosphere. A similar bending of the sun's light by our atmosphere occurs at sunset, and the sun is really seen for a short time after it would have disappeared, if the earth were not covered with an air layer.

At 1:43 A. M., eastern standard time, the moon will enter the umbra, or inner shadow. At 3:13 A. M. the total eclipse begins, when the moon will be completely within the umbra. Nine minutes later, 3:24 A. M. the middle of the eclipse will be reached. The only light that reaches the moon during the eclipse is that which is bent around the earth by our atmosphere. As the air passes red light more readily than blue, the eclipsed moon usually shows a ruddy color, but just how bright the moon appears at such a time is believed to be dependent on weather conditions on the earth. If the weather is cloudy over the part of the earth around which the light is bent, the eclipse would doubtless be darker than if this region were clear. The moon leaves the umbra, and the total phase is over at 3:35 A. M.

According to Dr. Fisher, this eclipse offers an excellent opportunity to test the effect of the atmosphere on the brightness of the eclipsed moon. At mid-eclipse the part of the moon indicated by the arrow on the diagram is just barely within the inner shadow. The light that illuminates this part just grazes the earth over a line crossing Canada from Alaska to Nova Scotia, and so weather conditions in this region will probably have a great effect.

In order to get an accurate idea of the weather conditions at the time of the eclipse in this critical region, Dr. Fisher, with the aid of Professor R. Meldrum Stewart, director of the Dominion Observatory at Ottawa, has arranged to have Royal Canadian Mounted Police, Catholic Missionaries to the Eskimos, and fur trappers, report weather conditions. G. A. Wendt, of the Canadian Westinghouse Company, has also arranged to have appeals for such weather observations sent out by radio.

However, as the sun will just be rising, and the eclipsed moon just setting in this region, it will not be a good place to observe the eclipse itself. In the northeastern part of the United States, the eclipsed moon will be low in the southern sky. In the southwestern part of the country, it will be higher and in the southeastern sky. Observations made in the United States of the eclipse itself during totality will be compared by Dr. Fisher with weather reports from Canada, in an effort to determine the effect of the earth's atmosphere.

As amateurs, with small telescopes, or even with the unaided eye, may be able to make observations that will be missed at the big observatories on account of cloudy weather, Dr. Fisher urges all who have the opportunity to observe the eclipse and report their results to him.

"Such persons," he says, "should note the following points, with instruments of any size, from opera glasses up, and with the naked eye:

"Geographical position, time zone, weather and sky conditions; time of each observation; size and powers, even of opera glasses, for each observation; times of contact of the edge of the moon and the edge of the shadow; description of the edge of the shadow; when and how the red color appears and disappears; spots or blotches apparently going across the moon during the eclipse, and so distinct from the ordinary lunar markings; and the visibility of the surface details of the moon, with naked eye, and a variety of instruments, if possible.

"A special observation, easy to make, and of interest, is of the visibility of the moon's features through colored glass. The easiest to get is blue cobalt glass, but good green glass, or ruby glass, like that which the photographer uses in his dark-room lantern, are more valuable, as they pass light more nearly of a single color. Such observations may also be made with the naked eye or a telescope."

Results of such observations should be sent to "Lunar Eclipses, Harvard College Observatory, Cambridge, Mass."

THE SLEEP OF WHALES

WHERE and when do whales sleep? This question is asked and partly answered by Robert W. Gray, of Exmouth, in a report to the scientific journal, *Nature*. Mr. Gray is the son of an old whaling captain, and has had many opportunities for first-hand observations on voyages in the northern seas.

Whales are warm-blooded creatures, related to the fur-bearing animals that live on land rather than to the fishes of their natural habitat; it is assumed, therefore, that they require sleep in much the same manner as land-living mammals. Once in a while they have been caught asleep at the surface by whalers—usually with fatal results to the whale. A whale suddenly aroused by being harpooned thrashes about for a few moments instead of diving at once, as whales do upon being harpooned while they are awake. For this reason, old-time whalers used to arouse sleeping whales by rapping sharply on their boats before casting their harpoons, because the startled floundering of the monsters might smash or swamp their craft.

But whales found sleeping at the surface are a comparative rarity, and Mr. Gray agrees with other whalers in believing that they require more sleep than they have been observed to take. He is of the opinion that they can sleep under water, and quotes statements to the effect that they may sleep under ice fields.

But sleeping under water, for an air-breathing mammal, has its difficulties. Mr. Gray inclines to the opinion that a sleeping whale, whether at the surface or submerged, does not breathe at all, but closes its blow-hole tightly to exclude water and slumbers while literally holding its breath. He calls attention to the fact that harpooned whales frequently remain submerged for as much as an hour, exerting every muscle in their fight for life, and

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reasons that the very much reduced breath-requirement of the sleeping animals would make it possible for them to remain submerged and sleeping for several hours before it became necessary to come up and "blow."

OATMEAL AND RICKETS

THE paradoxical situation of a Scot denouncing oatmeal as a deficient article of diet and of an American defending "the halesome parritch" has arisen out of the experiments of Professor Edward Mellanby, at the University of Sheffield, and of Professor Harry Steenbock, at the University of Wisconsin.

It is agreed among all physiologists that any cereal taken alone is deficient in vitamin D, which prevents the disabling bone disease, rickets, in children and young animals. Some time ago Professor Mellanby got results with oatmeal fed to puppies that were so much worse than those that followed a diet of other grain products that he assumed the presence of an unknown substance in oats, with action opposite to that of the vitamins, which he named "toxamine."

Now Professor Steenbock, one of the outstanding authorities on the formation and activities of vitamin D, states that he has very carefully repeated Professor Mellanby's oatmeal experiments. He states that while he finds oats to be somewhat inferior to wheat in the matter of preventing rickets, he can find no evidence that they are as bad as Professor Mellanby paints them, and that he is not convinced of the existence of the hypothetical toxamine.

While an exclusively cereal diet is practically certain to bring on an attack of rickets, Professor Steenbock adds that as ordinarily used, with the addition of other foods of high calcium content they are valuable elements in the diet. Cereals themselves may be given an adequate vitamin D content by exposure to ultra-violet rays.

ITEMS

EXPOSURE to ultra-violet rays, which has been shown in the case of cows to increase the vitamin D content in dairy products, does not work with fish, according to Charles E. Bills, research chemist of Evansville, Ind. Fish subjected to five-minute exposures of ultra-violet irradiation every other day for six weeks produced oil that displayed no more potency than that made from fish which had not been so treated. During the period in which the Newfoundland codfish fattens, it gorges itself on small fish known as caplin which contain only a small amount of vitamin D. To account for the unusually high potency of cod-liver oil the cod would have to consume, within a period of four weeks, about 26 times its weight of caplin, a most unlikely quantity. The presence of vitamin D in the liver of fish consequently is judged to be the result of chemical reactions in the body of the fish at present not clearly understood.

SEEDS of the Indian lotus a hundred years old have more active life in them than the same kind of seeds of last year's crop, according to a report of Dr. Ichiro Ohga, of the Educational Institute of Darien, Manchuria, to the *American Journal of Botany*. Dr. Ohga tested these ancient seeds both by sprouting and by chemical examination, and they won on both counts. The research was carried on during Dr. Ohga's sojourn in this country, at the Boyce Thompson Institute, Yonkers.

Is cancer one of the penalties people must pay for the comforts of a complex civilization? Cancer statistics from Mexico, just compiled by Dr. Frederick L. Hoffman, of the Prudential Life Insurance Company, point to the fact that cancer flourishes less among primitive peoples than it does among their more advanced neighbors. In his exhaustive survey of Mexico, Dr. Hoffman has found that the modern plague is far less frequent among the native Indians than among the inhabitants of cities. Mexican states in which the population is preponderantly Indian show a surprisingly low death rate from cancer, he states. Cancer is only from one half to two thirds as common in Mexico as in the United States and Canada. Contrary to general medical expectation, Dr. Hoffman's figures indicate that red peppers and chile are safe cancer hazards, at least to those inured to their effects. It has been conjectured that the irritations set up by the hot diet of the Mexicans would presuppose a high incidence of cancer of the stomach and the digestive tract. Such is not the case, however, according to Dr. Hoffman. Cancer is much commoner among women than men, possible reasons suggested being that it is a latent after-effect of frequent childbirth with lack of proper attendance and care.

ETERNAL ice, to depths of more than a hundred yards, binds the soil of northern Siberia even in summer, according to Professor Schostakowitch, of Irkutsk, who spoke recently before the Berlin Geographical Society. The frozen ground covers an area of 5,000,000 square kilometers, a territory half as large as Europe. In Jakutsk a well has been sunk to a depth of 117 meters without finding the bottom of the frozen stratum. The ice hinders the sinking of surface water, so that vast cold bogs or tundras are formed on what might otherwise be fertile soil. The only spots where thawing ever penetrates this everlasting ice are directly beneath stove-heated houses. Cases are on record where these thawed columns of soil tapped subterranean rivers flowing under the ice layer, resulting in veritable artesian wells that spurted to the ceilings and drove out the occupants. This water soon froze, turning the whole house into a solid block of ice, decorated with gigantic icicles.

"FEEDING the fishes" is not such a simple matter. The dietetic requirements of a trout are decidedly specialized. Experiments carried on by the U. S. Bureau of Fisheries show that beef liver, beef heart and sheep liver will do nicely for spring planting with steelhead, rainbow and brook trout, but when trout are to be reared to a larger size beef liver is what will produce the biggest and best trout. Something new on the menu may result from experiments with three new fish foods—soy bean oil meal, a dried shrimp product and a fresh-water mussel meal. In the future the fresh meat diet may be expanded to include these foods as substitutes for a part of the meat.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE BIOLOGICAL EFFECTS OF X-RAYS

To the fruit fly are due Thomas Hunt Morgan's discoveries in heredity, and scientists of the Institute of Cancer Research of Columbia University have used the eggs of this fly for some experiments on the biological effect of X-rays on different wave-lengths and intensity.

In X-ray treatment two kinds of X-rays are used, depending on the location of the disease. For treating conditions of the skin a long wave-length X-ray is employed. Such an X-ray does not penetrate much beyond the skin, but is absorbed by it. In treating internal disorders, however, the long wave-length X-ray, being absorbed by the skin, is valueless. An X-ray of short wave-length is resorted to, for short wave-length X-rays will penetrate the body.

The efficacy of X-ray treatment in combatting cancer lies in the power of the X-ray to kill the living cancer cell. It has long been a matter of debate as to whether the long wave-length X-ray was as deadly in its effect as the X-ray of short wave-length. By means of the fruit fly it has been proved in the Columbia research laboratories that the effect of X-rays depends, not on their wave-length, but on their intensity.

Fruit flies were chosen for the experiments because of their egg-laying propensities, for in her brief two weeks' existence the female averages 500 eggs. By using eggs for the experiments the effects of the X-rays could be watched without the possible interference of other factors. Under normal conditions fertilized eggs hatch. The only abnormal factor in the experiments was the X-ray. Therefore, it could be deduced, such eggs as did not hatch were killed by the X-rays. Also a fertilized egg resembles a cancer in that it starts as a single cell and during the process of growth divides and redivides into many cells. And, as an unlimited supply of eggs was needed in order to produce conclusive results, what more to the point than the fertile fruit fly?

Dr. Charles Packard, in charge of the experiments, used 50,000 eggs in deriving his conclusions. First he noticed that under normal conditions 97 per cent. of the eggs would hatch. Then he proved that eggs were killed by the X-ray according to its intensity rather than its wave-length. The same amount of a long wave-length X-ray, he found, would kill the same percentage of eggs as would a short wave-length X-ray of like intensity.

"These experiments show," he stated, "that the amount of biological effect of the X-ray is proportional to the intensity of the X-ray beam and wave-lengths of X-ray beams are not important."

Thus a use besides the detection of rotten fruit has been found for the little flies known to scientists as Drosophila, meaning literally fruit-lover.

GLASS TRANSMITS ULTRA-VIOLET RAYS

TUBERCULOSIS victims, rickety babies and other shut-ins can now enjoy the health-giving rays of sunlight indoors. The council on physical therapy of the American Medical Association has tried out the various glass substitutes on the market that have been designed to admit the ultra-violet rays cut out by ordinary window glass, and have found four that pass muster of both spectroscopic and biological tests.

Two of the samples tested are transparent to the visible rays of sunlight as ordinary window glass, though one can be supplied in an opaque form if desired. Both partake of the nature of true glasses but are more expensive. They will probably find considerable use ultimately, in solaria, nurseries, schools and playrooms.

The other two samples are of a less permanent character and did not rank quite so high in the tests as the first two in their power to admit anti-rachitic rays. One is composed of a wire-mesh screen filled with some sort of celluloidinous material while the other is a thin, fairly loosely woven cloth treated with a paraffin-like substance. These are opaque but more or less unbreakable and sell at a lower figure than window glass. They do not withstand weather so well as glass but are well adapted, the council suggested in their report, for windows in cow barns and chicken houses in which they can be placed in winter and removed in summer.

INERT SAND IN THE MISSISSIPPI DELTA

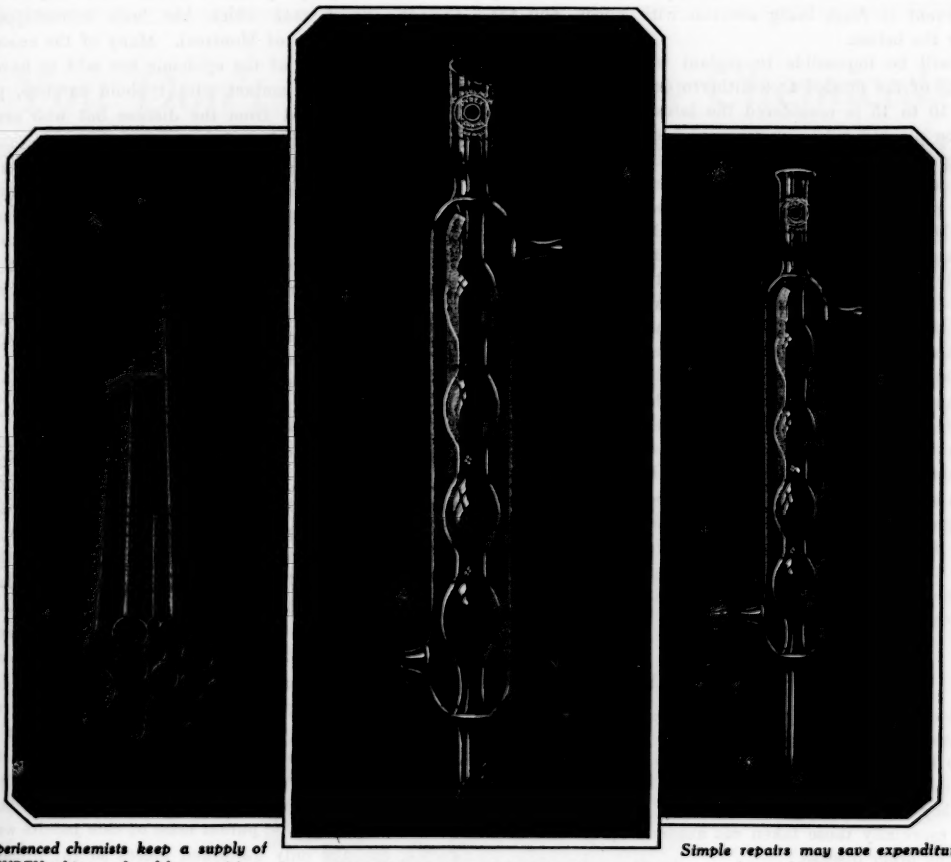
ABSOLUTELY inert sand, requiring from eight to ten years to be modified to a point where even grass will grow, is one of the tragedies facing farmers in certain sections flooded by the Mississippi.

A report from B. R. Coad, government entomologist in charge of cotton insect investigations at Tallulah, La., states that inert sand covers several miles of the finest and most beautifully developed farming land of the Mississippi Delta, in the Scott district. Other similar but smaller sand deposits have been noted at various points of the flooded parts.

According to H. H. Bennett, of the U. S. Bureau of Soils, such deposits of inert sand are made when the current of the rushing waters is slightly slowed down, as when it meets with a comparatively small obstruction. The sand is composed largely of quartz particles which, since they are rock fragments, are heavier than the fertile silt and clay content of the water. The sand content naturally separates itself first, while the silt and clay are carried along in the water and deposited when the current is farther slowed down. The sand, due to its quartz make-up, is infertile and consequently for years nothing can be grown in areas where it is deposited. To remove it would be too expensive a proposition.

EMERGENCY CROPS FOR FLOODED FARM LANDS

WHAT to do about the planting of several million acres of flooded improved farm land? This is the important question to be faced by the farmers of this area, as the



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waters recede. The land must be replanted in some crop to prevent it from being overrun with weeds, and the sooner the better.

It will be impossible to replant in cotton the large amount of the flooded area hitherto devoted to this crop. June 10 to 15 is considered the latest date that cotton may be planted with any reasonable expectation of producing a fair crop in a normal season.

Other crops must be planted in part of the area formerly planted in cotton. These crops, according to the U. S. Department of Agriculture, should be ones that can be planted from June 10 to August 1 so that they will provide food as soon as possible for the family and for livestock, and bring in some cash as well.

Crops suitable for late planting in the flooded area, according to the Department of Agriculture, are certain late varieties of corn and forage sorghums, Sudan grass, German millet, velvet beans, Spanish peanuts, certain varieties of soy beans and cowpeas. Sweet potatoes can be planted quite late in the lower Mississippi Valley, but elsewhere farmers must depend upon the hill sections for plants and cuttings. Though it will be too late to plant most garden crops by the time the land is dry enough to work, it will be possible to get a crop of cabbages, collards, turnips, black-eye peas, Kentucky wonder beans, late tomatoes and snap beans and squashes if sufficient seeds can be procured.

VACATIONISTS AND TYPHOID

THE exodus into the great open spaces that begins about now has moved Assistant Surgeon-General W. F. Draper, of the U. S. Public Health Service, to urge vacationists to be on the safe side and have a typhoid inoculation before they set out. Typhoid follows in the wake of vacations, especially those taken *via* automobile, almost more than any other disease.

Therefore, if means have been devised to avoid the hazard of typhoid fever they should be consciously known and applied as guiding principles in our vacation plans. The germs that cause typhoid fever are usually conveyed through contaminated water, milk or food.

A safe rule to follow relating to water is to drink water only from known safe supplies. Most city supplies are safe, for chlorination of public water supplies is now almost universal. If you are out of reach of known safe water you should boil the water and make it safe. The only safe milk is pasteurized milk. If then you use only milk that has been effectively pasteurized you may be reasonably assured of safety from this source.

The epidemic of thousands of cases of typhoid fever that has raged all spring in Montreal has led to serious apprehension on the part of federal health officers in this country. Tourists and organizations contemplating sessions in that city are advised to be inoculated if, considering the danger involved, it is still absolutely necessary to include Montreal in their itineraries. For a time an embargo was placed on the shipment of milk into the United States from any point in the area included within a radius of 200 miles of Montreal, but this has been modified so that properly certified milk is accepted from Canada except that which has been transshipped or handled in the city of Montreal. Many of the cases during the early part of the epidemic are said to have had their origin from contact with typhoid carriers, people who have recovered from the disease but who are still capable of transmitting the contagion.

Children from ten to fourteen years old are the most susceptible, according to statistical studies on typhoid made by the Metropolitan Life Insurance Company. Adolescents in the succeeding years from fifteen to nineteen, though not so susceptible, show the highest death rate. The actual danger of a fatal termination in typhoid cases increases continuously with age, as might be expected, and is greatest in old age in the very period where liability to infection is the least.

AZTEC "JADE"

THE mystery of the source of the jade-like stone used by the Mayas and ancient Mexicans for making images and ornaments has been solved by the discovery of a mass of the rock at Zimapan in the State of Hidalgo. The discoverers are Professor Ramon Mena, chief of the department of archeology of the Mexican National Museum, and engineer De La Cerda.

The abundance of objects carved out of this stone, and the absence of any known deposits of jade in Mexico, was long taken as evidence of an Asiatic origin of the Indian tribes of that region, and of a long-continued trans-Pacific traffic. However, it has been known for some years that the stone is not a true oriental jade, but a mineral known technically as nephrite, belonging to the class of stones known as jadeite, resembling jade but not identical with it. The parent mass of this jadeite was not known, and the only unworked pieces so far brought in have been rounded pebbles found in water-courses. It was as a result of a search for the source of these pebbles that the two Mexican scientists came upon the jadeite deposit.

Jade and jadeite have been held in high veneration by many widely scattered primitive races. The earliest jade used was in the form of water-smoothed pebbles and these were rough and lacked the polish that made later jade ornaments so beautiful. The beauty of jade and similar stones was probably discovered with the coming of the New Stone Age, it is said, when polishing was applied generally to stone implements and ornaments used. Its toughness, its ability to take a very high polish and keep it, the beautiful coloring, and its peculiar "feel" when polished, probably gave it the popularity it has held for thousands of years among many races.

Although jadeite has hitherto never been found in place in Mexico many archeologists suspected that some day it would turn up, because many worked objects found in sepulchers or among other prehistoric remains showed that they were originally river pebbles. This is obvious from the shape as well as from portions of the rough surface that remains. In the Mexican National Museum there is

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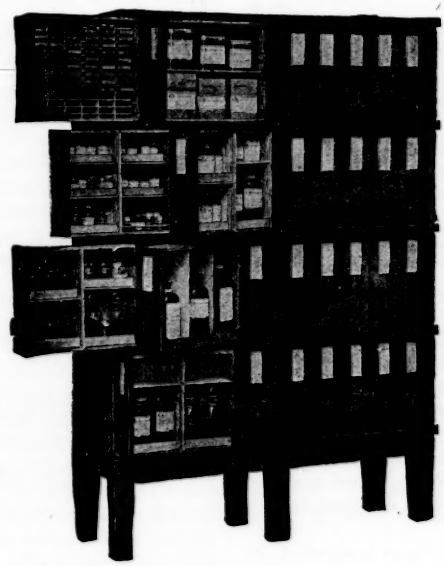

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a large collection of jadeite bead necklaces obviously made from river pebbles.

The collection of ornaments, statuettes, earrings, pendants, plaques, breast ornaments, collars, amulets and other objects in the Museum of Mexico City is one of the most remarkable in the world. Recently a beautiful vase, a foot high, carved in the front to represent the Aztec flower god Tlaloc, from Tlauchititla in the State of Mexico, was added to the collection.

A TEACHER OF SCIENCE FOR CHILDREN

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Directors of the Malting House School at Cambridge are convinced that the active interest of early childhood loses its keen edge after a few years spent under instruction according to present educational methods. They believe that the emotional and intellectual drives, "usually grouped together in the term curiosity, exist in the early lives of most people, and that their striking loss in later years, rendering many born with good brains intellectually ineffective and tired of life, is due to some large extent to laming by early influences. The most consciously held aim of the educator should therefore be to avoid damaging these drives, and lest his life should pass in loading ships with ballast, to rank that aim before that of the installation of knowledge—particularly in the early years when relatively little knowledge can be instilled and great damage done."

Preliminary work with children of faculty members of Cambridge University at Malting House School has been sufficiently successful to encourage the directors to further its development.

"At present," they state, "there is no recognized, infallible or easily-applied technique for the preservation of curiosity during education, and it is not least for the investigation of this, one of the social problems of the age, that the directors hope to make of the appointment advertised the beginnings of a research institute. Nevertheless they believe that the learning of how to learn and a scientific scrutiny of familiar things, an attitude of critical curiosity and intellectual aggression to the unknown, requires to be preceded by the discovery of the idea of discovery."

To date replies have been received from 7 professors and university lecturers, 62 workers in other branches of science, 47 with other qualifications, and 39 without any qualifications. Sir Ernest Rutherford, former winner of the Nobel prize for physics and director of the Cavendish Laboratory of Physics at Cambridge, Professor Percy Nunn, well-known educational author, and J. B. S. Haldane, biologist and essayist, will assist in making the final selection of candidates.

ITEMS

THE decrease in the amount of mineral elements in the soil has been the object of close study by Dr. John S. Burd, of the University of California, who spoke before the First International Congress of Soil Science, in session in Washington. He has found that these elements, some of which are essential to the growth of plants, decrease progressively in concentration as the cropping season advances, and also that in fields continuously under cultivation they show a certain decrease from year to year. This decrease is not due entirely to the bodily removal of the minerals by the plants, but some part of them becomes bound in the soil so firmly that they can not be pressed out or extracted with water.

PECULIAR rock formations in the Big Bend country of Texas, recently proclaimed to be petrified trees, forming the largest forest of its kind in the world, are now stated not to be trees at all, by Dr. E. H. Sellards, of the Bureau of Economic Geology of Texas. Dr. Sellards states in a communication to Science Service that one of the discoverers of the supposed forest revisited the place after he had made his first report, and that the re-examination of the formations convinced him that the peculiar stones were not petrified trees at all. Another visit, by the Texas state land commissioner, confirmed this negative report. Samples of the rock brought out have proved upon investigation by specialists not to be petrified wood.

THE hotly debated question—How does participation in college athletics affect the longevity of the student?—is at last to be decided. Through cooperation with some 40 colleges and universities, the Metropolitan Life Insurance Company has secured the histories of over 9,000 "letter men" who were members of the class of 1905 and prior years. Statisticians who will work on this material expect to produce a study that will show the representative mortality of college athletes throughout the country. The results from this work will be of especial interest because little research has been done on the longevity of athletes. The sports to be covered are football, rowing, track, baseball, basketball, la crosse, cross-country and hockey.

OUT of the 357 smallpox death toll recorded by the Metropolitan Life Insurance Company for United States and Canada for the last year, 232 occurred in California. In spite of the fact that the number of cases in the two countries has been reduced from 37,616 in 1925 to 31,351 in 1926 there is little basis for optimism in the smallpox situation in this country. Only two states in the union, Vermont and Rhode Island, were entirely free from the disease, according to the figures compiled by the Health Section of the League of Nations. It is also pointed out that with respect to actual numbers the United States had more cases than any country outside of Asia, with England and Wales coming next.

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SCIENCE NEWS

Science Service, Washington, D. C.

THE UNSEEN LIFE OF THE SOIL

UNSEEN and unknown to almost everyone, invisible because of their microscopically small size and always hidden in subterranean darkness, there is a whole swarming world of life under our feet. Its members are often weird in form, sometimes beneficent, sometimes harmful in their acts, but never for a moment, day or night, without their effect on the giant world of plants and animals and men that lives forgetfully above them.

This world of the soil microbiota, forgotten or ignored by all save a relative handful of scientists scattered over the earth, was outlined before the first International Congress of Soil Science meeting in Washington by Sir John Russell, director of the oldest and greatest agricultural experiment station in the world, at Rothamsted, England.

The effects wrought by soil bacteria, fungi, protozoa and other forms of life are manifold. Lowly plants called algae capture carbon dioxide from the air, build it into their bodies, and eventually, when they die, release their organic substances as humus for the enrichment of the soil. Many kinds of soil bacteria, both free-living and associated with other plants, are able to capture the otherwise inert and useless nitrogen gas from the air, which is eventually turned by the higher plants into meat-making proteids.

Bacteria break down dead plant and animal bodies, returning them to the dust from which they came; if it were not for this activity, the earth's surface would soon be cumbered with carcasses, with all the material basis of life locked up in them beyond recovery. This process is not a simple one, carried on by only one class of bacteria.

One gang of these microscopic wreckers goes to work, carries the process as far as its nature permits, and then quits. Another takes its place, forwards the work another stage, and in its turn passes it on to still other groups. At last the complex substances of the dead body are again the simple compounds that plants can use, and the upbuilding process begins once more.

Tearing down is as important a process in the cycle as setting up; for there are only just so many bricks for life to build with, and they must be used over and over. These lowly creatures of the soil, which may be our own unrecognized evolutionary ancestors, do the cosmos a service by plucking down our abandoned dwellings so that our descendants may make houses for themselves.

CARBON DIOXIDE FOR PLANTS

THE carbon dioxide discarded by bacteria as a by-product of their life-processes comes to man's table as his daily bread. We live on the exhalations of billions of tiny beings which we never see.

This, in brief paraphrase, is the doctrine laid before the International Congress of Soil Science by Dr. Julius Stoklasa, of the Technical Institute and Experiment Station of Prague, recognized as one of the leading authorities in the world on the difficult science of plant nutrition.

The old theory that plants build their food out of carbon dioxide which they capture from the air by means of their leaves, Dr. Stoklasa said, is entirely inadequate. The supplies of this gas in the air, according to his measurements, are not sufficient to account for the sugars, starches and other substances formed by plants with the assistance of the sun's energy. But the soil solution contains a great deal of carbon in the form of bicarbonates, and this carbon is taken into the plant along with the other soil minerals used by the plant, and borne by the sap to the green parts where carbohydrate manufacture is going on.

The amounts of carbon taken in from the soil, Professor Stoklasa asserted, compare in quantity with the amounts of other minerals assimilated. Thus, for every hundred pounds of carbon so absorbed, 154 pounds of nitrogen, 113 pounds of phosphoric acid, 106 pounds of potash, 33 pounds of calcium oxide and 26 pounds of magnesium oxide are taken in. This indicates a hitherto little suspected and wholly unmeasured part played by carbon dioxide in the soil.

Of course not nearly all of the carbon dioxide given off by soil bacteria gets into the plants. A great deal of it escapes upwards into the air. But here the leaves are waiting for it, and it passes into the plants through the channels hitherto taught as orthodox according to the accepted doctrines of plant physiology.

Furthermore, according to Professor Stoklasa, fertilizers added to the soil are by no means entirely for the direct benefit of the corn or clover or other crops. A large share of these plant condiments fall to the share of the bacteria, stimulating them to greater activity in the production of materials eventually used in the production of foods by the higher plants.

BIRTH RATES IN EUROPEAN COUNTRIES

FRANCE'S birth rate is increasing, while the birth rates of all other principal nations engaged in the world war are dropping, according to Dr. Warren S. Thompson, of the Scripps Foundation for Population Problems at Oxford, Ohio. Dr. Thompson is now studying population trends in Europe. Records from Russia are not available, but figures from other nations show: France's births per thousand came up from 18.8 in 1913 to 19.2 in 1924. England and Wales dropped from 24.1 to 18.8, in the same period. The birth rate in Germany was 27.5 in 1913. In 1925 it was only 20.4. In the decade beginning just before the war Austria's rate dropped from 29.6 to 22.3; that of Hungary from 34.5 to 28.4; that of Italy from 31.7 to 29.1.

France is not only keeping its birth rate up to the prewar figure, but is even making a little gain. Propaganda for larger families and the influx of immigrants into industrial centers probably have an important bearing on the problem. It also seems likely that the expansion of French industry and its increased production exert a favorable influence. The general feeling of optimism

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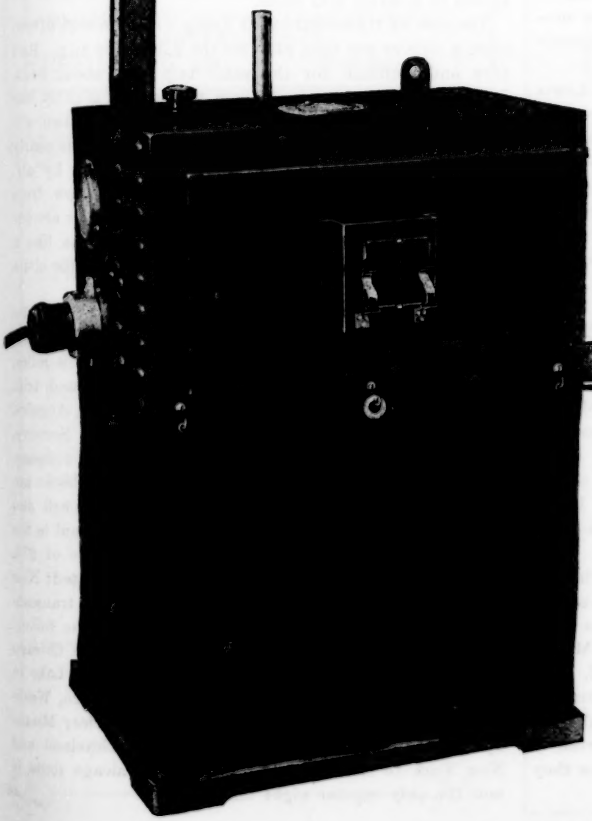

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about the future that is prevalent in France is a marked contrast to the atmosphere of pessimism in Germany and Great Britain, and it seems reasonable to believe that the general tone of outlook on the future may have an important effect on a nation's birth rate.

MAGNETIC STORMS AND SUN SPOTS

MANY large spots have appeared on the sun in the last few months. With them have come magnetic storms on the earth, disturbances of the earth's magnetism. The compass needle behaves in an erratic manner, and telegraph lines are deranged.

Miss Hazel M. Losh, of the Mt. Wilson Observatory, told members of the Pacific Division of the American Association for the Advancement of Science meeting at Reno, Nev., of the magnetic observations that she has made. Last September 12 a large group of spots appeared. A magnetic storm began on the fourteenth, and continued until the spot was carried out of sight by the sun's rotation. Then it was carried around in front again, and the magnetic disturbances were again evident.

In April of this year a long stream of spots appeared. These were in the center of the solar disc, as we see it, between the eleventh and thirteenth. On April 14 there was another great magnetic disturbance.

Every eleven years the spots on the sun become very numerous. This year or next will bring such a period of maximum, but probably with even more spots than normally come at such a time. Therefore, more magnetic storms can probably be expected.

At the same meeting Miss Losh's colleague, Dr. Lewis H. Humason, told the astronomers of his study of a group of spots that appeared in March. These were also accompanied by magnetic disturbances on the earth. The chief point of interest, however, was their own magnetism. Sun spots are huge magnets. Reversing the usual procedure, the forward one in the March group showed a north-seeking pole. Those that followed showed south-seeking poles.

AIRPLANE OBSERVATIONS OF THE ECLIPSE

FOR the first time an astronomer will observe a total eclipse of the sun from his own airplane. Gerald Merton will fly over England to see and photograph the eclipse of June 29. Merton was a pilot in the Royal Air Force during the war. He recently bought an airplane of his own for scientific use. With him will be Major P. H. Hepburn, war aviator and formerly president of the British Astronomical Association.

Another attempt to photograph the eclipse from the air, and so to rise above the clouds that may prevent terrestrial observations, will be made by two astronomers from the Royal Observatory at Greenwich, William M. H. Greaves, chief assistant, and William M. Witchell, head of the Observatory's Magnetic and Meteorological Branch. They will fly in a Handley-Page air liner provided by a London newspaper. At first, it was stated, they agreed to make the trip merely for the fun of it, but that now they expect to secure good observations.

With the large machine they have chosen, they hope that difficulties from vibration will be minimized, and the pilot thinks that he will be able to keep the machine pointed at the sun. Photographs will be made with lenses of great speed, so that exposures can be made in one fifth and one twenty-fifth of a second.

Another astronomer, F. J. Hargreaves, director of the photographic section of the British Astronomical Association, will accompany Greaves and Witchell. With an ultra-rapid lens, what the photographer calls F. 2, he will try to photograph from the air the shadow of the moon as it sweeps across the earth. If successful, it will be the first time that this has been done.

PASSENGER AIR LINES

BY August 1 anyone will be able to fly from New York to San Francisco with the speed of air mail. By July 1 the western half of this route from Chicago to San Francisco will be open. Later airliners will ply between New York and Miami, *via* Atlanta. America will then begin to rival Europe's passenger airlines just as it now excels in air mail routes. The New York-San Francisco route will be the world's longest airplane passenger line. Information obtained from Major Ernest L. Jones, of the Department of Commerce's new organization controlling commercial aviation, indicates that these important advances in aviation will occur.

The cost of transcontinental flying will be about fifteen cents a mile or less than $400 for the 2,500-mile trip. Rail fare and Pullman for the same trip cost about $140. The fastest rail time from coast to coast is slightly less than four days (87 to 96 hours) while the air time will be about a day and a third (31 to 32 hours). Thus nearly three days of time will be saved by traveling by air. Those who prefer wings to wheels can travel now from Boston to New York for $30. The air time-tables are out with directions for passengers. The table looks like a railroad one with arriving and leaving times for the cities *en route*.

Other passenger air routes now running are: The Colorado Airways, Inc., operating from Cheyenne to Pueblo, $45 round trip. The Western Air Express, 589 miles, from Salt Lake City to Los Angeles, $150 round trip. The Pacific Air Transport, from Seattle to Los Angeles, 1,073 miles for $132 one way. The Stout Air Services, between Detroit and Grand Rapids, is the only company issuing commutation books of ten trips. These books are to be had for $160. The Northwest Airways will also begin service from Chicago to Minneapolis-St. Paul in the immediate future, with a round trip ticket rate of $75.

The following airways are now completely lighted: New York to Boston, St. Louis to Chicago and the transcontinental route from New York to Salt Lake. The following routes will be lighted this year: Dallas to Chicago and Cheyenne to Pueblo (nearly finished); Salt Lake to Los Angeles; Salt Lake to San Francisco; Pasco, Washington to Elko, Nevada; Seattle to Los Angeles; Minneapolis, St. Paul to Chicago; Detroit to Cleveland and New York to Atlanta. The New York-Chicago route is now the only regular night mail service.

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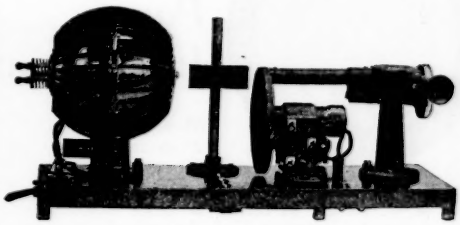

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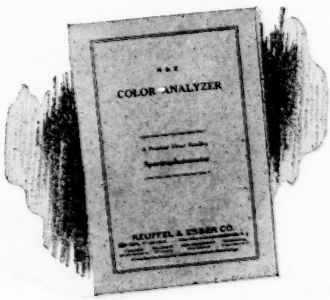

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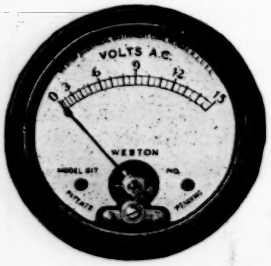

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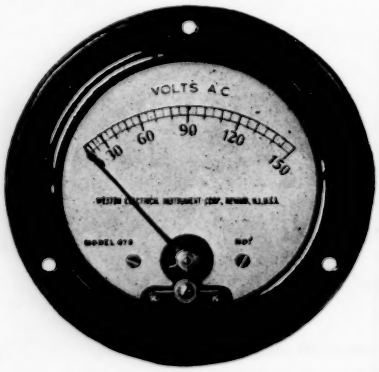

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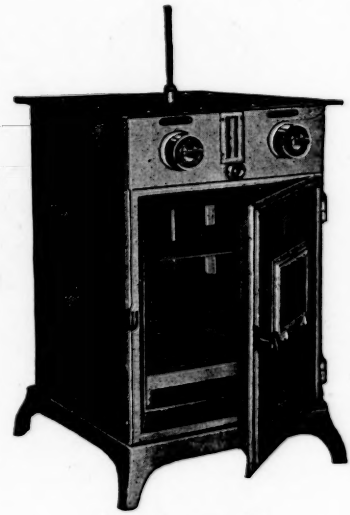

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